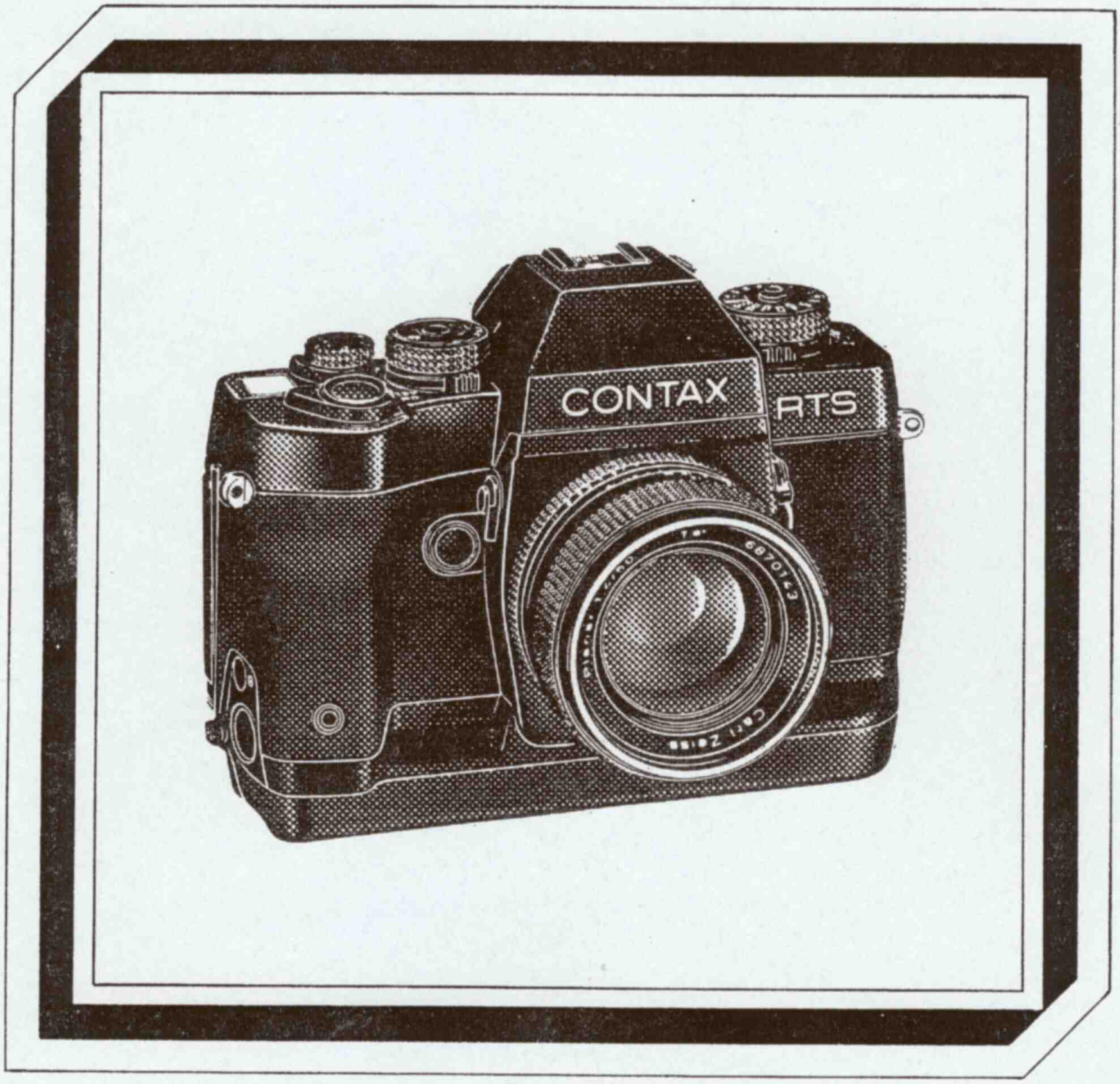
KYOCERA



CONTAX RTS III

Repair Manual

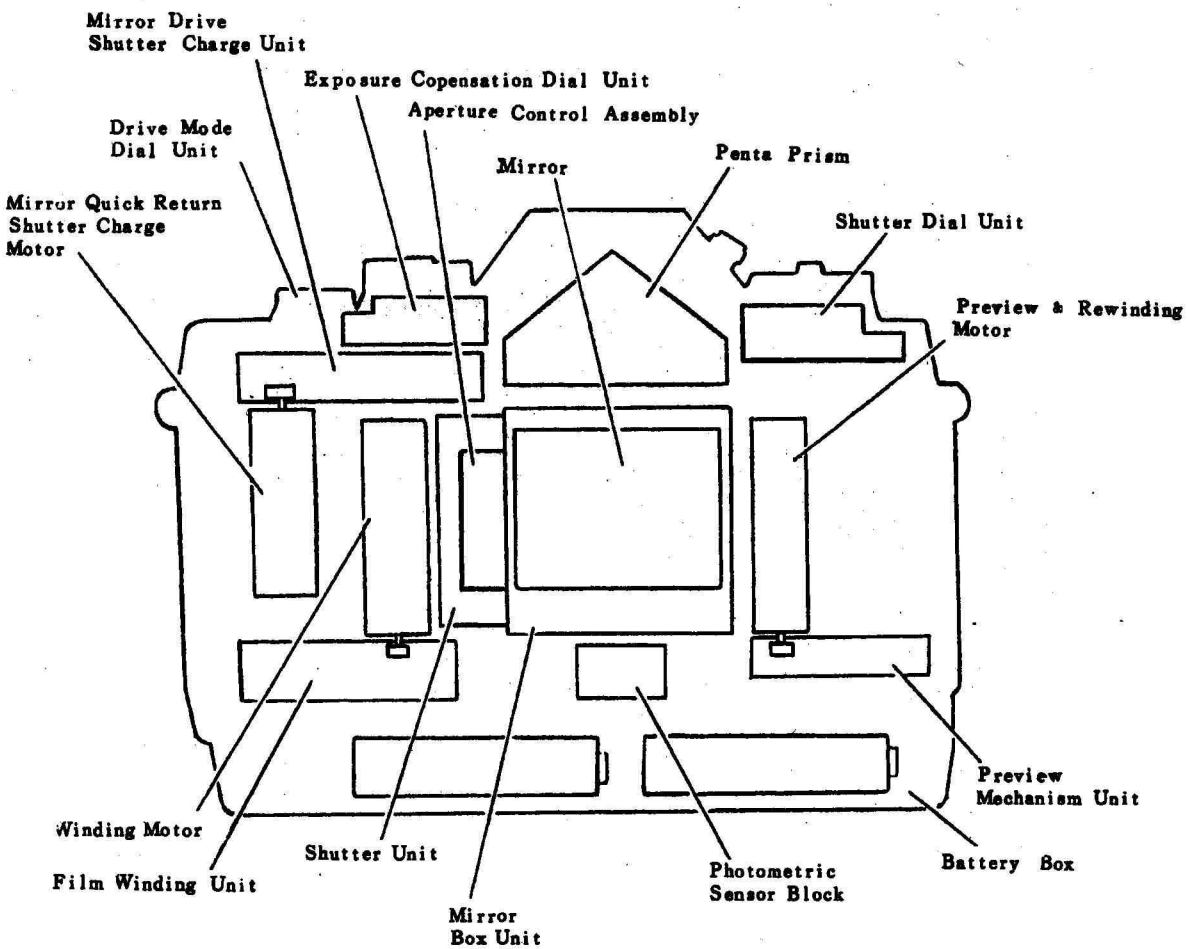
CONTAX RTSIII Specifications

Type	35mm focal-plane shutter auto/manual exposure SLR
Picture Size	24 x 36mm
Lens Mount	Contax/Yashica mount
Shutter	Electronic quartz-controlled, vertical-travel, metal focal-plane shutter
Shutter Speeds	32 seconds to 1/8000 sec. in auto mode; 4 seconds to 1/8000 sec., B (bulb), X (1/125, 1/250sec.) in manual mode
Flash Synchronization	X-synch at 1/250 sec. (or slower) via direct hot-shoe or X-synch terminal
Shutter Release	Electromagnetic w/exposure check function by half depressing top release; additional side release (w/lock) for vertical camera positioning, cable release socket, and dedicated B (bulb) cable release socket
Self-timer	Quartz-controlled, electronic self-timer with either 10 or 2 sec. delay (selectable); Cancelable during operation; Blinking LED together with film counter indicates remaining (countdown) time
Exposure Modes	Aperture priority auto exposure; Shutter speed priority auto exposure; Manual exposure; TTL auto flash; Pre-flash TTL auto flash; Pre-flash TTL metering manual flash
Metering System	TTL full-aperture, center-weighted average metering / TTL full-aperture spot metering (switchable); Two SPDs (Silicon Photo Diode) provided, one on the upper portion of the pentaprism (center-weighted), and the other at the bottom of the mirror box (spot)
Metering Range	EV0 to 21 for full-aperture, center-weighted average metering, EV3 to 21 for spot metering (ISO 100, f/1.4 lens)
Film Speed Range	ISO 25 to 5000 in DX auto mode; ISO 6 to 6400 in manual mode
Exposure Check	Indication either by pushing the dedicated exposure check button or depressing the release button half way (indication remains visible for 16 seconds)
AE Lock	Image plane exposure value is stored by operating the main switch; Available in either center-weighted or spot metering
Exposure Compensation	±2EV (presettable in 1/3EV increments)
ABC Mechanism (Automatic Bracketing Control)	3-frame continuous compensation in the order of standard, over-and under-exposure (range switchable, ±0.5EV or ±1.0EV); Usable in aperture priority AE, shutter speed priority AE or manual exposure control
Flash Modes	TLA direct shoe, and via synch terminal connection; TTL direct flash control possible with TLA flash system; Pre-flash TTL spot metering function built-in; Second shutter curtain synch possible with Contax TLA 280 flash unit
Viewfinder	Fixed pentaprism, eye-level with long eyepoint; approx. 100% field-of-view, 0.74x magnification with 50mm lens focused at infinity; built-in eyepiece shutter
Dioptric Adjustment	Internally adjustable from +1D to -3D
Focusing Screen	Standard split image/microprism collar (interchangeable)
Viewfinder Display	Shutter speed, under-/over-exposure, film counter, ABC display, pre-flash display, flash status indicator, aperture, exposure mode, exposure compensation warning, light metering mode
External LCD display	Film counter, film transport indicator, battery warning
Film Loading	Automatic motor advances film to frame "01" once release button is pressed
Film Advance	Automatic motor; When continuous shooting HIGH selected, approx. max. 5 frames per second, LOW mode, approx. max. 3 fps
Drive Mode	Mode selector dial; Single, continuous LOW or HIGH, 2 or 10 sec. self-timer, multiple exposure
Film Rewind	Automatic rewind/stop by operating lock release button and rewind lever (film leader remains outside cassette)
Mutiple Exposure	Possible by presetting the drive mode selector (automatic reset, presetting required for each frame)
Exposure Counter	Automatic resetting (additive type); Countdown in rewinding; Exposure time displayed in "B" shooting; Compensation status indicated when using ABC function
Depth-of-Field Preview	By pushbutton (effective in aperture priority AE, manual exposure)
Mirror-up Mechanism	Dedicated lever
Camera Body Construction	Diecast aluminum alloy for main body, diecast magnesium alloy for top cover, and titanium for bottom cover
Film Pressure Plate	Ceramic; Vacuum mechanism combined
Date Imprinting Device	Data back provided as standard (imprinting made in between frames); Imprinting of year/month/day, day/hour/min., no imprint, month/day/year, day/month/year (selectable); 3V lithium battery used for date imprinting (CR2025)
Power Source	1.5V AA-size batteries x 6 or one lithium battery (2CR5).
Battery check	Automatic voltage check (confirmed on the display panel by turning on the main switch)
Dimensions & Weight	156(W) x 121(H) x 66(D)mm (6-3/16 x 4-13/16 x 2-5/8 in.), 1,150g (2.53 lbs) (batteries not included)

*Specifications and external features subject to change without prior notice.

Internal Structure

The internal structure of CONTAX RTSⅢ centers around the mirror box unit and shutter unit in the middle. To the left (viewed from front) are the winding motor and the mirror drive and shutter charge motor.
Those mechanism units are arranged in their independent positions above and below the film winding spool chamber. On the right side of the mirror box are the preview mechanism and rewinding motor, to which the mechanism unit is connected. In the upper part of the body, there are the penta prism and finder unit in the middle. To the left of them are the drive unit and exposure compensation dial unit, and to the right are the shutter dial and shooting mode selector unit, which are both connected to the external operation block.
In the bottom of the camera body is the battery box to hold six SUM-3 size AA batteries.



〔Internal Structure〕

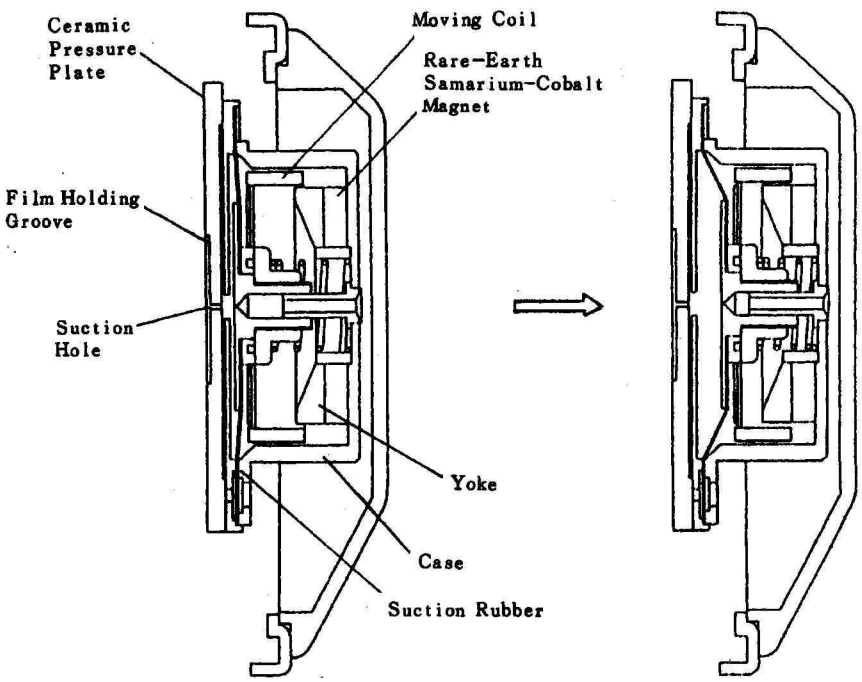
RTV (Real-Time Vacuum) Mechanism

This vacuum mechanism installed on the back of tne pressure plate holds the film against the pressure plate under suction through the suction hole in the plate.

In this mechanism, a strong magnetic field is generated in the yoke gap by a rare-earth samarium-cobalt magnet. And the force created by the current flowing through the coil in the gap pulls back the suction rubber connected to the coil and thus attracts the film onto the pressure plate surface via the suction hole in it.

In holding under suction the film against the pressure plate, the flatness of the pressure plate is of critical importance.

Accordingly, the pressure plate is made of a ceramic, which features a stable perfomance and a flatness of 5 μm or less.



Before Suction Suction achivated

〔Sectional View of Vacuum Mechanism〕

1. Vacuum function

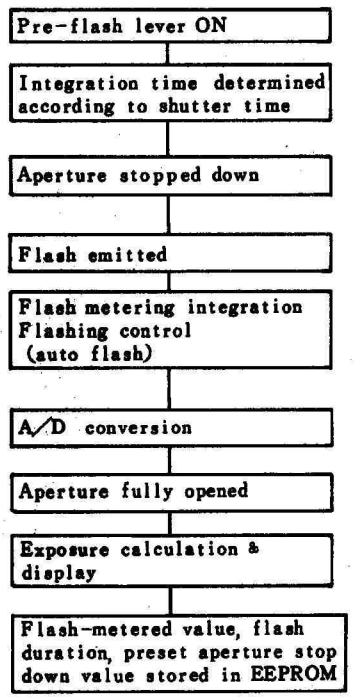
The vacuum function operates at the reception of ON signal from the camera. The signal can be output at any time.

2. Vacuum operation

- o The vacuum operation starts immediately before mirror-up.
- o The vacuum operation ends after second curtain run.
- o Even When the drive mode is "continuous", the start and end timing of vacuum operation are the same as in "single" mode.
  (Suction and release are repeated for each frame.)
- o The camera supplies the vacuum signal and power (battery).
- o The vacuum operation is inhibited when the B1(BC " " mark lit) alarm is on.
- o Suction continues automatically for 32 seconds.
- o The vacuum function does not operate when there is no film in the camera.

Pre-flash TTL Spot Metering

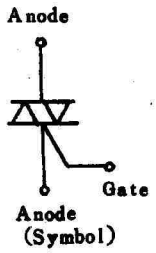
Turn the pre-flash lever on, then a flash signal sets off the flash by turning on the triac (bi-lateral current control element) at a command from the CPU. Then the flash light reflected from the subject is led in via a sub-mirror in back of the main mirror. Upon this, the pin photodiode combined with an amp at the bottom of the mirror box meters Ø5 mm portion in the center of the focusing screen. The result of this metering is displayed in a bar graph in a range of ±2EV within the viewfinder. This display changes as the aperture stop down value is changed. When the TTL auto flash is on, the pre-flasn function not only controls the flash emission, but also memorizes the flash duration. The actual flash duration will be controlled in accordance with this memorized data.



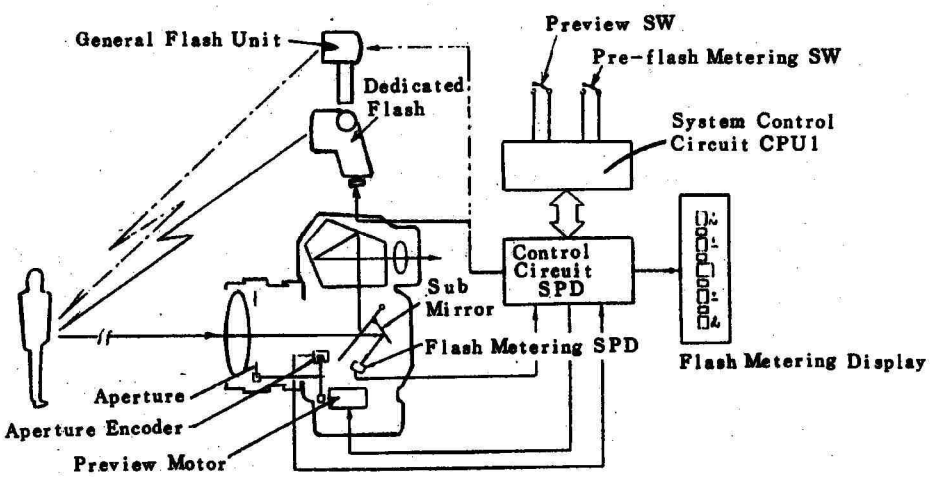
〔Pre-flash Operation Sequence〕

When the TTL auto flash is used, the pre-flash funciton causes a display of metering result within the viewfinder, and the exposure display changes in linkage with the change in the aperture. The flash-metered value, flash duration and preset aperture stop down value are all stored in the EEPROM. Since they are kept there even through the replacement of batteries, the desired flash sooting can be resumed. Note also that setting the pre-flash lever in the OFF position turns on the TTL direct metering flash shooting mode.

* Triac: 3-electrode a.c.power control element. A triac has a symmetrical characteristic of NPNPN in the forward and reverse directions. It controls the currents in both directions by passing current through a gate.



* EEPROM (Elecfrically Erasable Programmable Read Only Memory): This read-only memory for microcomputer allows rewriting of the contents by a special procedure. The memory is protected even when the main power is cut off.



〔Flash Metering System〕

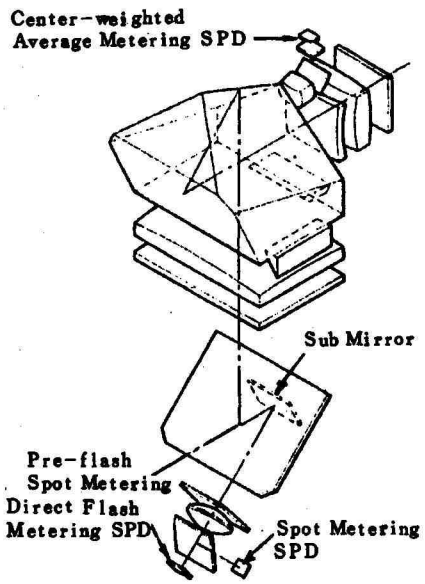
1. Flash metering range

ISO 25-800 (not inciuding exposure compensation)

Exposure Control

1. Center-weighted average metering

The center-weighted average metering SPD is so located that the center-portion of the diffuse surface of the focusing screen can be metered via an aspherical lens and mirror.



Metering Configuration

2. Spot metering

Spot metering, pre-flash TTL spot metering and direct flash film-surface metering are performed with the respective SPD's located in the bottom of the mirror box. Light passing through the middle of the main lens is reflected by the sub-mirror behind the main mirror, passed through a filter and condensing lens, then divided by a half mirror into transmitted light and reflected light. The reflected light is led into the general light spot metering SPD, whereas the transmitted light is led into the pre-flash spot metering/direct flash metering SPD. Spot metering uses the centeral portion of about 3㎜ diameter of the focusing screen.

3. ABC (Automatic Bracketing Control)

The ABC function offers automatic exposure compensation for three consecutive frames. The compensation is done in the order of normal, over and under.

- o Aperture priority AE, manual: Control of shutter speed
- o Shutter speed priority AE : Control of aperture
  (The shutter speed is controlled automatically when the aperture control range is surpassed.)

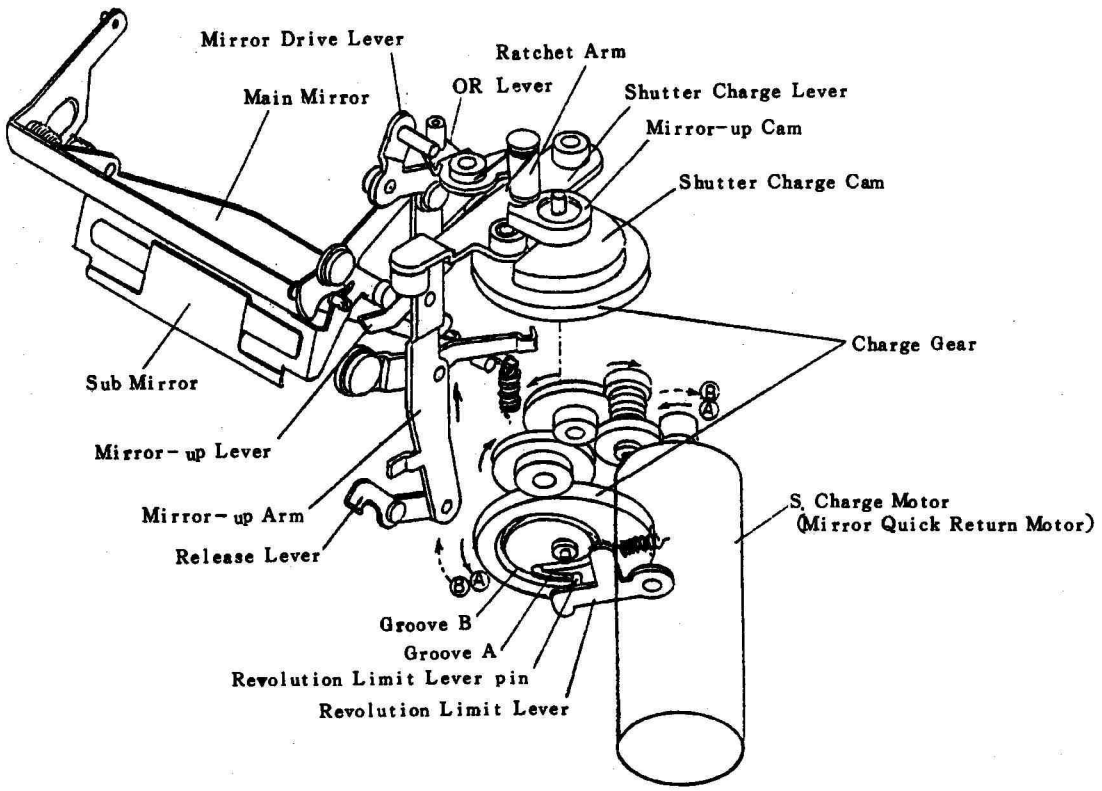
Principal Mechanisms

1. Mirror Drive Mechanism

The S. charge motor connects to the charge gear via a reduction gear train. This charge gear, combined with a shutter charge cam and mirror-up cam, is provided with revolution angle limit grooves.

The revolution limit lever can move along these grooves. As the S. charge motor runs in the Ⓐ direciton, the mirror-up cam pushes the ratchet arm, raises the mirror-up arm, and at the same time pushes up the mirror-up lever, thus raising the mirror. The pin in the groove A of the charge gear comes to a stop at the first stopper. But immediately before that the mirror-up is completed, with the MU switch turning on. 5 msec.after the receipt of this signal, the S. charge motor stops its forward run.

Immediately before the completion of mirror-up, the shutter is started by the release lever.



〔Mirror Drive Mechanism〕

After the shutter motion, the S. charge motor reverses. This causes the pin in the groove of the charge gear to move into the groove B and the charge gear to rotate to the beginning stop position.

In the meantime, the mirror lowers with the return of the mirror up cam, and at the same time the shutter charge cam pushes the shutter charge lever and the roller at the end charges the shutter. Simultaneously with the charging of the shutter, the revolution limit lever pin moves to the left along the groove, turning on the charge switch on its way to the leftmost position.

Just before the end of shutter charge revolution, the revolution limit lever moves to the right, turns off the charge switch and stops the charge gear rotation mechanically at the end of the groove.

As the charge switch is turned off, power for the motor run in shutter charge direction is shut off.

2. Film Transport Mechanism

The film transport sequence comprises the high-speed drive mode, in which a parallel drive is done almost simultaneously with shutter charge, and the low-speed drive mode, in which a series drive is done after shutter charge.

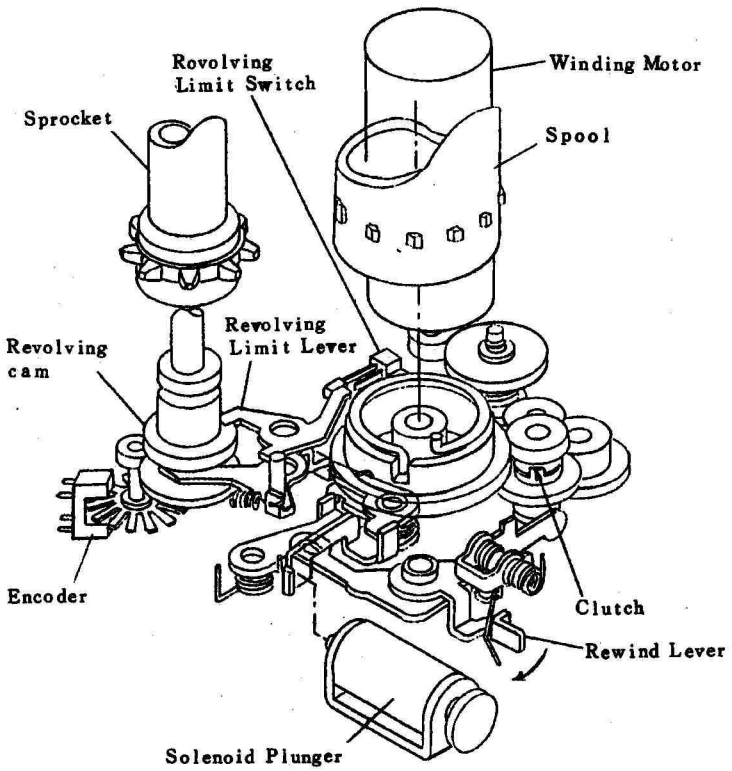
The film transport mechanism employs a spool drive system. As the winding motor inside the spool is driven, the film is wound by the revolution of the spool via a gear train.

Film frame positioning is done by a reliable mechanism that causes the single-revolution limit lever to jump into the single-revolution limit cam connected coaxially to the sprocket. At the same time, as the single-revolution limit switch, linked to the single-revolution limit lever, turns off, power to the winding motor is cut off and the counter counts up.

Immediately before the start of the next winding, the solenoid plunger, upon receipt of an electric signal, operates to release the single-revolution limit lever. Thus this mechanism is completely independent of the shutter charge and other mechanisms, so that there is no film movement at multi- exposure.

3. Film Rewind

Push the rewind lever in the direction of the arrow, and the clutch between the winding gears (8) and (9) will be disengaged from the motor, thus releasing the spool. At the same time, the lever operation will release the revolving limit lever from the revolving limit cam.
Accordingly, the sprocket will be released and the rewind switch will be turned on. An "ON" signal from the rewind switch will energize the rewind motor to start rewinding. During rewinding, the encoder, interlocked with the sprocket, stops all the other mechanisms than the reverse frame counter and film reader. After completion of rewinding and film replacement, the system returns from rewind mode to winding mode at the start of auto loading.



〔Film Advance Mechanism〕

4. Preview Mechanism

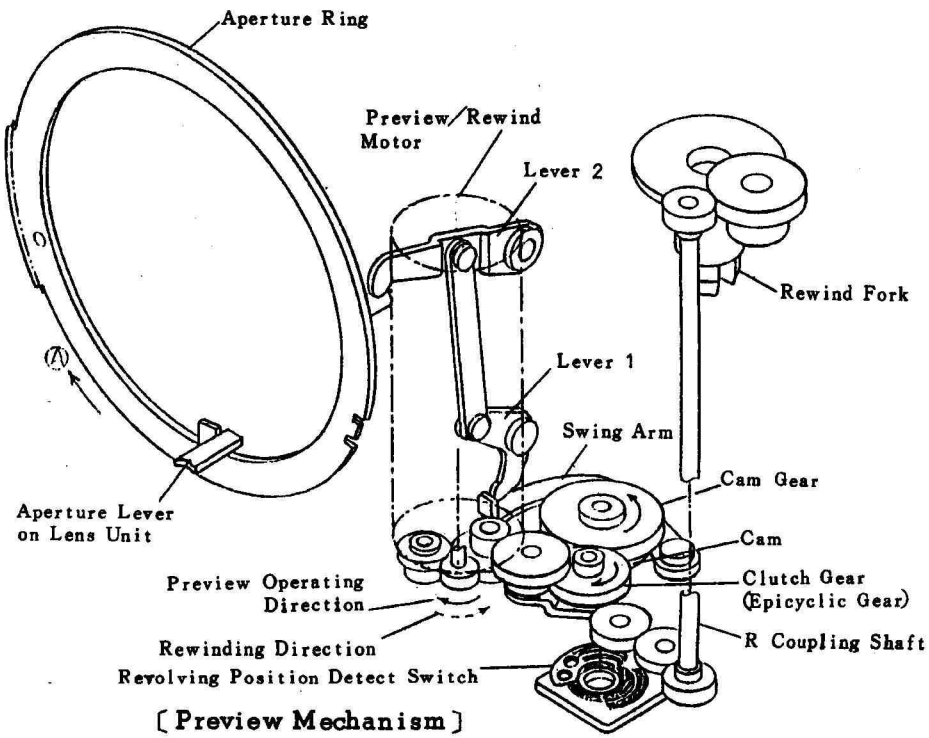
The unique preview mechanism of this camera is driven by a motor which also serves as the drive for rewinding. This setup was chosen to automate the aperture stop down for the functioning of the pre-flash spot metering mechanism. In preview operation, the motor turns clcokwise (in the direction of the arrow shown in a solid line) and drives the gear train including the clutch gear (epicyclic gear) and the cam under the cam gear. When the cam rotates in the direction of the arrow, the swing arm moves to the right. As a result, the lever 1 pulls down the lever 2 and turns the aperture ring in the direction of the arrow Ⓐ until the lens is stopped down to a predetermined aperture. When the cam rotates in the opposite direction, the gear train moves the aperture ring from the minimum-aperture position to the full-aperture position. Thus, the mechanism repeats closing and opening the aperture. The revolving position detect switch connected to the cam gear operates to stop the aperture ring correctly at the full-aperture position or the minimum-aperture position.

This way the preview mechanism allows the checking of aperture stop down by easy button operation.

The preview mechanism whose circuit is interlocked with the lever for operating the flash meter, operates the motor for aperture stop down and lights the flash. After flashing, the aperture ring returns to the full-aperture position again.

The unique structure permits instantaneous flash metering with the aperture stopped down to the preset value.

In film rewinding, as the motor is reversed, the clutch gear (epicyclic gear) disengages from the cam gear and engages with the R gear. Therefore, the R coupling shaft is driven via the gear train and the rewind fork connected to the top of the cartridge is turned to perform film rewinding.



〔Preview Mechanism〕

Mechanism of Assemblies

1. Shutter Charge Unit

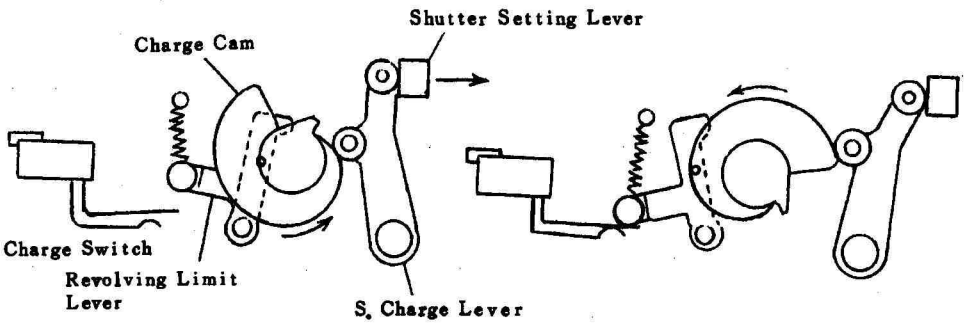
Like the CONTAX 137MD, this camera performs shutter charge, aperture control stopper setting and multi-exp. lock lever release by means of the normal and reverse runs of a motor.
The motor also drives the mirror and the aperture ring via the mirror-up base plate unit.

(1) Shutter Charge Motor

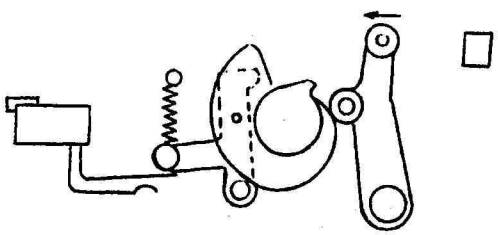
Upon receiving a release signal, the shutter charge motor runs to perform mirror-up, drives the aperture lever (aperture stop down) and activates shutter release. The motor stops when the mirror-up switch is turned on. After shutter operation, the motor reverses to perform mirror-down, aperture opening, release of shutter charge and the multi-exp. lock lever after multiple exposure, and setting of the aperture magnet released in the TV mode. The motor stops when the charge switch (timing switch) is turned off.

(2) S. Charge Lever

After the travel of the second curtain, the charge cam starts reversing and pushes the S. charge lever, thus pushing the shutter setting lever to the right. Shutter setting is completed when the charge cam reverses by about 3/4 of the full travel. Then the shutter charge system returns to the initial state prior to mirror-up.



[Before Shutter Charge] [Completion of Shutter Charge]



[Stop of Shutter Charge Motor]

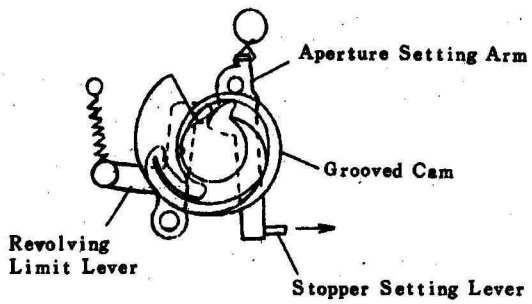
(3) Charge Cam

The charge cam performs three functions.
It rotates to control the mechanical sequence.
Mirror–up, aperture stop down and shutter release are performed by a 70–degree turn of the cam.
The shutter charge system is initialized with the cam reversed by 420 degrees.

(4) Revolving Limit Lever and Aperture Setting Arm

The revolving limit lever and aperture setting arm are mounted on the S. charge lower base plate.

The revolving limit lever, interlocked with the grooved cam on the charge cam, limits the rotation of the charge cam.
The revolving limit lever is almost stationary while the charge cam is turning in the direction of mirror–up. At the initial stage of the shutter charge rotation of the cam, the revolving limit lever moves quickly to the right, so that its end pushes the root of the aperture setting arm. Now the end of the aperture setting arm moves to the right to set the aperture magnet. After that, the revolving limit lever moves along the groove to the left and turns on the charge switch on the way to the leftmost position. Immediately before completion of shutter charge rotation, the revolving limit lever moves to the right to turn off the charge switch and stop the rotation of the charge cam mechaniccally at the end of the groove. Power to the motor for shutter charge is shut off at the turning–off of the charge switch.

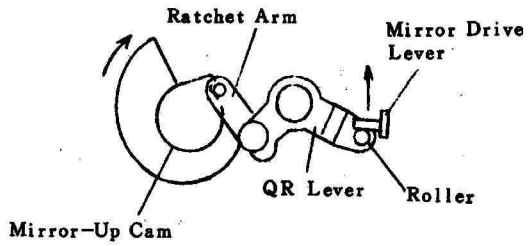


(Setting of Aperture Magnet)

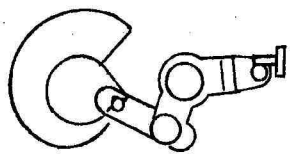
(5) QR Lever and Ratchet Arm

Like the CONTAX 137 MD, this camera uses the ratchet arm mechanism to perform mirror–up.
Before mirror–up, the mirror–up cam and the ratchet pin are engaged with each other. Immediatly after start of the Shutter charge motor, the mirror–up cam pushes the ratchet pin and moves the ratchet arm and caulked QR lever in the direciton of mirror–up. Then the roller on the QR lever pushes up the mirror drive lever on the mirror–up base plate ass' y to perform mirror–up and aperture stop down.

Around the completion of mirror–up, the mirror–up switch is turned on and five milliseconds later the charge motor comes to a stop.
When the shutter charge motor reverses, the mirror–up cam is released for mirror–down and aperture opening.



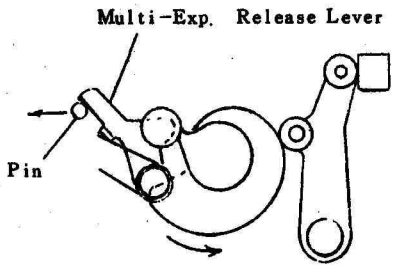
〔Before Mirror–Up〕



〔Completion of Mirror–Up〕

(6) Multi–Exp. Release Lever

The multi–exp. release lever is mounted on the bottom of the shutter charge upper base plate. During the reverse run of the shutter charge motor, the multi–exp. release lever is pushed by the mirror–up cam and moved to the left, pushing the pin on the ISO dial base plate to cancel multi–exposure state.

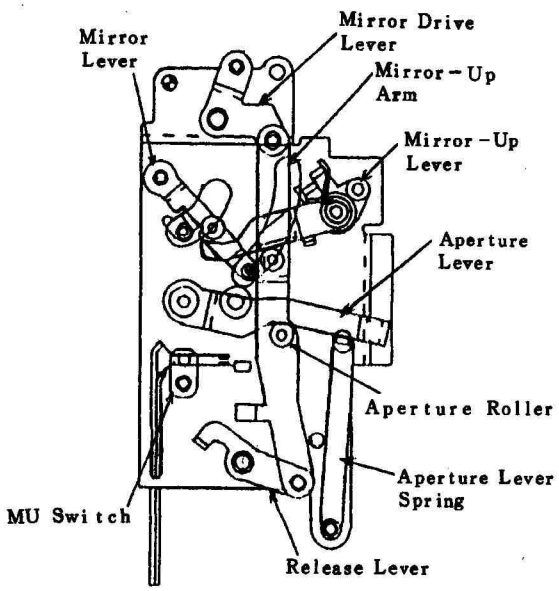


〔Multi–Exposure Release during Winding〕

2. Mirror–Up Base Plate Ass' y

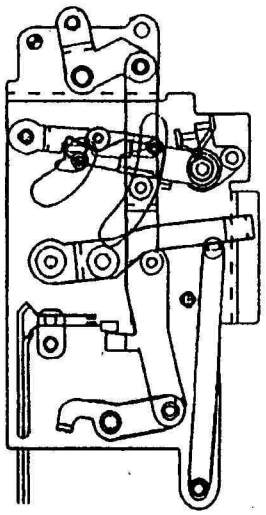
The mirror up base plate ass' y on the left side of the mirror box, driven by the QR lever on the S. charge unit, performs mirror–up, mirror–down, aperture closing or opening, shutter release and turning on/off of the MU switch.
The illustration (1) represents the initial state prior to mirror–up. The aperture lever, pulled by the apperture lever spring, pushes the aperture ring in the full–aperture direction.

When the mirror drive lever is moved to the left by the QR lever, the mirror-up arm moves upward and the mirror-up roller pushes up the mirror-up lever. The mirror-up lever pushes up the mirror lever, and the two rollers on the mirror lever push up the mirror. The aperture roller pushes up the aperture lever, and the aperture ring, following the aperture lever, moves in the direction of aperture stop.



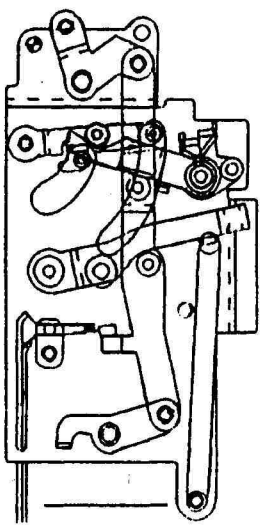
(1) Initial State

During mirror-up operation, the release lever unlocks the shutter release to allow shutter travel.



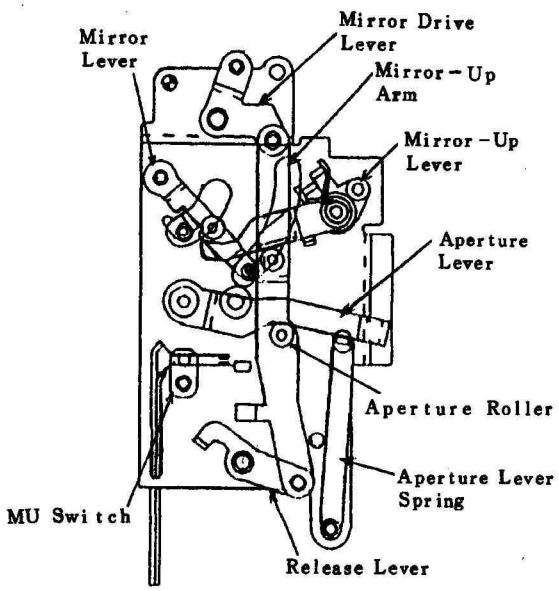
(2) Shutter Releasing

The illustration (3) shows the linkage position when the MU switch is turned on. Five milliseconds after receiving this "ON" signal, the shutter charge motor stops running.
After shutter travel, the shutter charge motor starts reversing to release the QR lever. Then all the levers on the mirror-up base plate ass' y return to the intial state by the aperture lever spring and other spring force applied in the direction of mirror-down.



(3) MU Switch on

When the mirror drive lever is moved to the left by the QR lever, the mirror-up arm moves upward and the mirror-up roller pushes up the mirror-up lever. The mirror-up lever pushes up the mirror lever, and the two rollers on the mirror lever push up the mirror. The aperture roller pushes up the aperture lever, and the aperture ring, following the aperture lever, moves in the direction of aperture stop.



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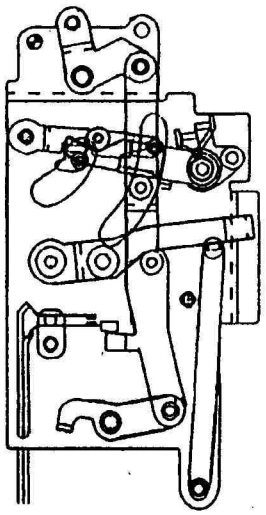

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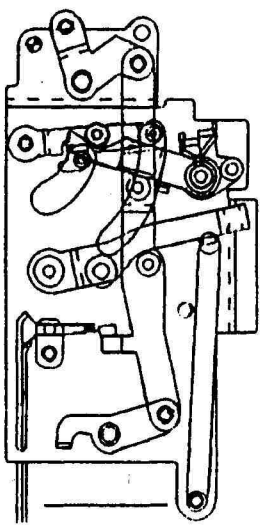


(3) MU Switch on

3. Aperture Control Ass'y

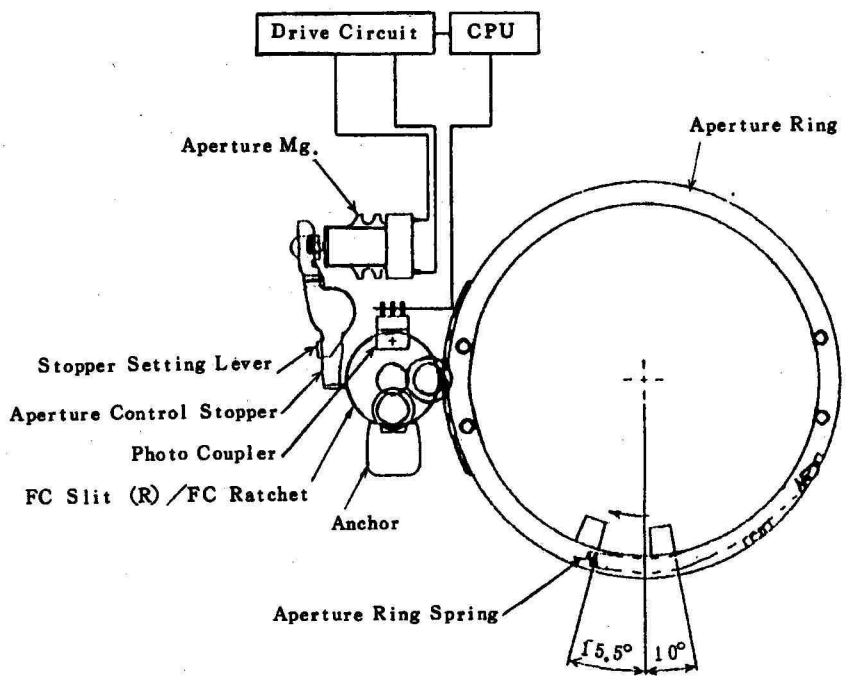
This camera uses the same aperture control mechanism as CONTAX 167 MT. The aperture ring is pulled by the aperture ring spring in the direction of aperture stop down. When the aperture lever is moved upward during mirror-up operation, the aperture ring turns clockwise.

The circumferential gear of the aperture ring drives the AC gear (3) via the FC gears (1) and (2). The AC gear (3) is provided with the FC slit (R) and FC ratchet. The FC slit, in combination with a photo coupler, detects the travel of the aperture ring. At the detection of a selected travel, the aperture magnet is energized.

The aperture control stopper, engaged with the magnet armature of aperture magnet, is pulled by a spring in the direction of releasing the magnet armature. At excitation of the aperture magnet, the magnet armature comes off and the aperture control stopper trips in the FC ratchet to stop the aperture ring.

At shutter charge after shutter travel, the aperture setting arm on the S. charge unit pushes the stopper setting lever to the right, so that the magnet armature is attracted by the aperture magnet and the aperture control stopper is disengaged from the FC ratchet. Then the aperture lever pushes the aperture ring in the direction of aperture opening to return it to the initial state.

During lens stop down, the delay gear is engaged with the anchor to keep a constant sto-down speed.



4. Mount Base Unit

(1) Ring Plate Ass' y

With the ring holder base plate in between, the aperture interlock ring (on the mount side) and aperture ring (on the shutter side) are caulked coaxially containing rollers and supported at three points.
The aperture interlock ring is engaged with the aperture code ass' y via the aperture interlock gear (B) and pulled by a spring in the direction of aperture opening. The aperture ring, having a notch equivalent to the maximum travel and stopped by a projection on the ring holder base plate, is always pulled in the direction of aperture stop down by a spring force applied between the aperture ring spring cover and the apertue ring.
The pin on the grip side is pushed by the aperture lever to keep generally the aperture ring in the full-aperture position. During mirror-up operation, however, the gear on the aperture ring is engaged with the aperture control ass' y so that the position of the aperture ring is controlled. The pin on the cartridge side of the aperture ring is pushed by the aperture lever (L) during preview operation to control the aperture.
The open F. STOP signal lever, locked on the ring holder base plate, is pulled by the open F. STOP signal lever spring in the direction of aperture opening.

(2) Aperture Code Ass' y

The aperture code ass' y, engaged with the aperture interlock gear (B) on the ring plate ass' y, converts the position of the aperture interlock ring to an electrical signal.
The aperture code ass' y has the same structure as that of CONTAX RTS Ⅱ.

(3) Theta Setting Ass' y

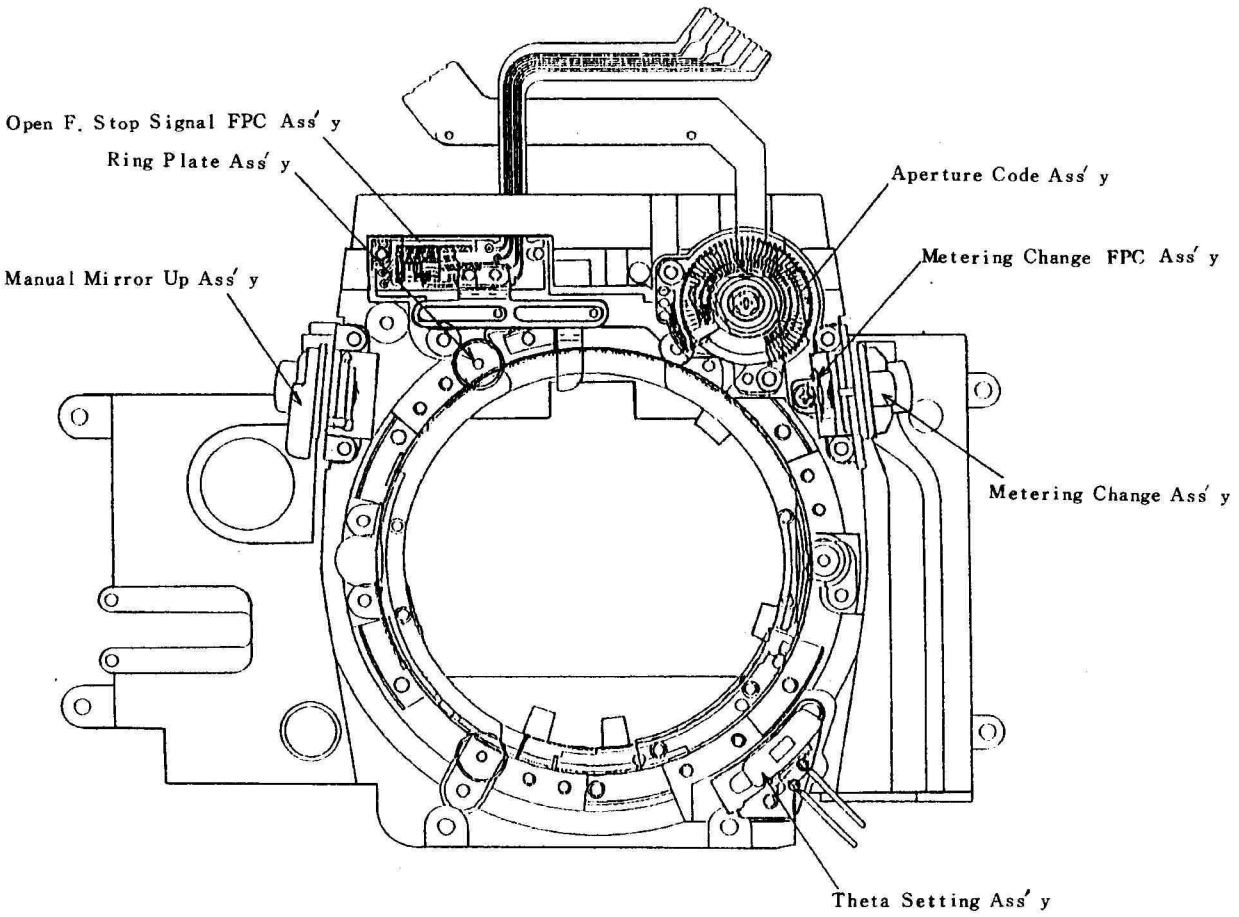
The theta setting ass' y, interlocked with the theta setting pin on the lens unit, converts the theta compensation value to an electrical signal.

(4) Manual Mirror Up Ass' y

The manual mirror up ass' y incorporates the mirror up knob and lens lock button.

(5) Metering Change FPC Ass' y/Metering Mode Ass' y

The metering change FPC ass' y/metering mode ass' y converts the switching between average metering and spot metering to an electrical signal. It also turns on the preview switch when the preview button is pressed.



5. Shutter

The shutter speed is controlled electronically with two magnets.

The S. charge lever on the S. charge unit pushes the setting lever on the shutter assembly to set the shutter. The release lever on the mirror up base plate ass' y releases the release lever on the shutter assembly.

To use the mechanical bulb function, install a mechanical cable release in the bulb-dedicated cable release socket and actuate the release. Then the mech. bulb slide plate is pushed to the right and pushes the mechanical bulb ever shaft engaged with the slot at the right end of the mech. bulb slide plate, so that the end of the mech. bulb lever presses the back iron lever on the shutter assembly to hold the second curtain.

At the same time, the mech. bulb lever pin turns on the mech. bulb switch to actuate the mirror-up operation and first curtain travel and waits until the mech. bulb switch is turned off.

Return the cable release, and the mech. bulb slide plate and mech. bulb lever will be restored to the initial state. Then the mech. bulb switch is turned off and normal shutter charge operation is performed to set the shutter.

6. Winding Unit

(1) Revolving Limit

The sprocket shaft is provided with a revolving limit mechanism. When the sprocket is rotated by advancing the film, the spring is charged and the revolving limit lever trips in the revolving limit cam. At the same time, the release spring is also charged and the spring force releases the revolving limit mechanism immediately before next winding start when the solenoid plunger is activated to release the hook.

The revolving limit switch interlocked with the revolving limit lever turns off power to the winding motor and advances the counter.

This operation is performed by rotation of the sprocket caused by film advance. Therefore, the revolving limit switch does not operate when no film is loaded or auto loading is not performed correctly, That is, this mechanism facilitates checking for the presence of a film and its advance.

(2) Encoder

The motion of the sprocket can be checked by the photo-interrupter and the 16-tooth slit plate, which turns three times when the sprocket turns one time. The output of the photo-interrupter is used to perform reverse operation of the counter during rewinding, control the rewinding speed and a part of the film leader remains out of the cassette.

(3) Solenoid Plunger

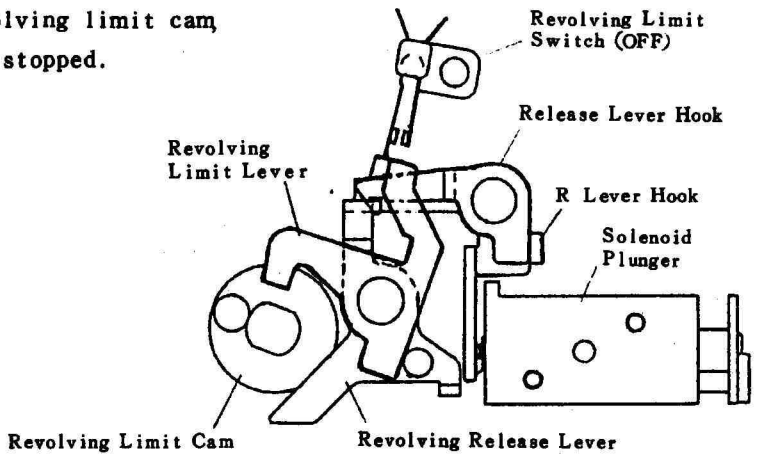
The solenoid plunger, controlled by electric signals, releases the sprocket from the revolving limit mechanism and recovers the winding mechanism from rewinding state.

(4) Winding Motor

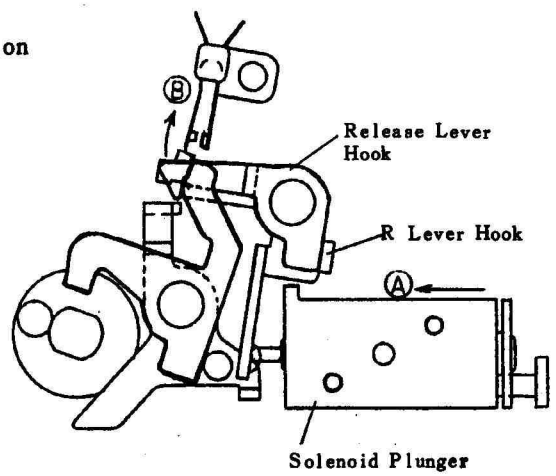
The coreless motor realizes high-speed, silent winding.

(5) Winding Operation

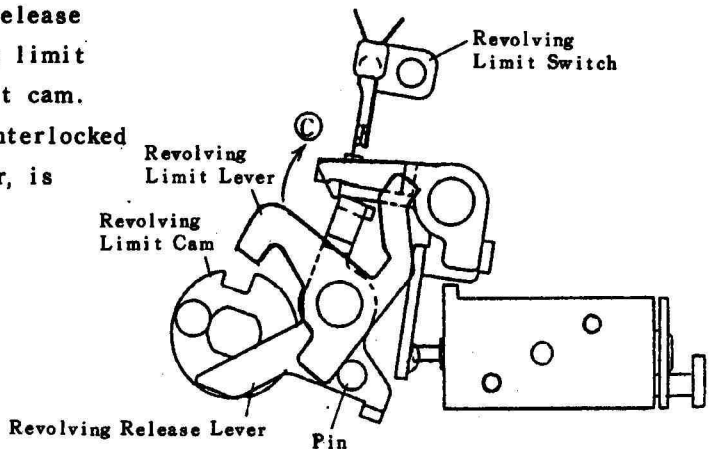
① Initial state before winding
The revolving limit lever, having tripped in the revolving limit cam, keeps the sprocket stopped.



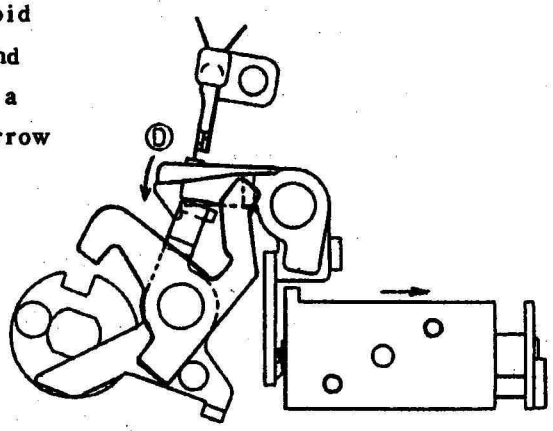
② The solenoid plunger, when energized, moves in the idrection of the arrow Ⓐ to turn the R lever hook and release lever hook in the direction of the arrow Ⓑ.



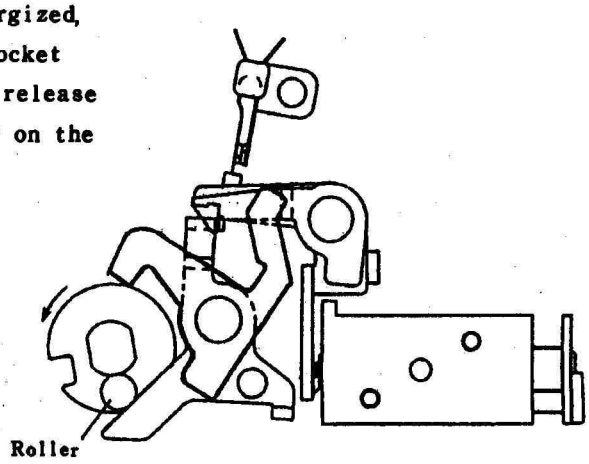
③ When the release lever hook is dis-engaged, the revolving release lever is turned by a spring in the direction of the arrow Ⓒ. At this point, the pin caulked on the revolving release lever disengages the revolving limit lever from the revolving limit cam. The revolving limit switch, interlocked with the revolving limit lever, is turned on.



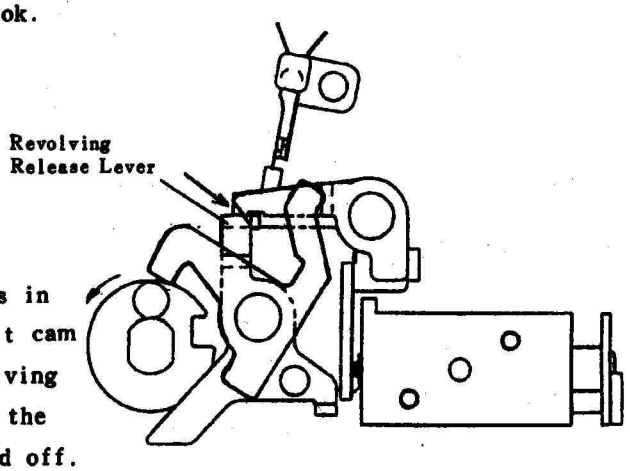
④ The revolving limit switch, when turned on, shuts off power to the solenoid plunger. Then the R lever hook and release lever hook are turned by a spring in the direction of the arrow Ⓓ.



⑤ When the winding motor is energized, the film is wound and the sprocket is driven. Then the revolving release lever is charged by the roller on the sprocket shaft.



⑥ The charged revolving release lever is held by the release lever hook.

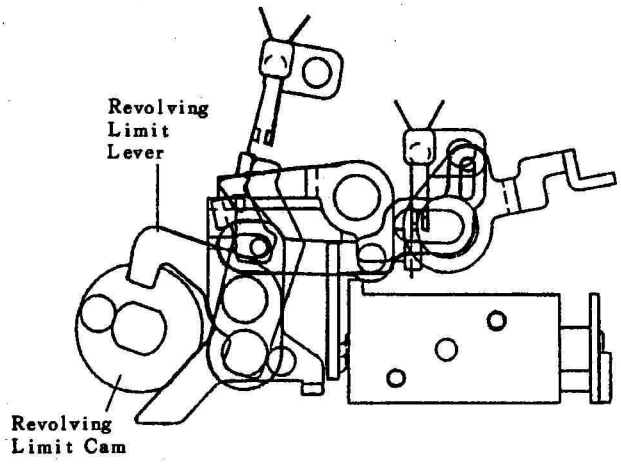


⑦ The revolving limit lever trips in the notch of the revolving limit cam to stop the sprocket. The revolving limit switch, interlocked with the revolving limit lever, is turned off. This "OFF" signal shuts off power to the winding motor.

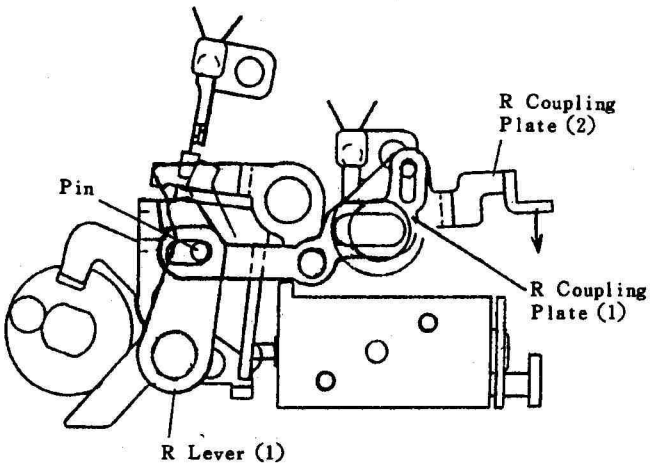
(6) Rewinding Operation

① Initial state before midway rewinding

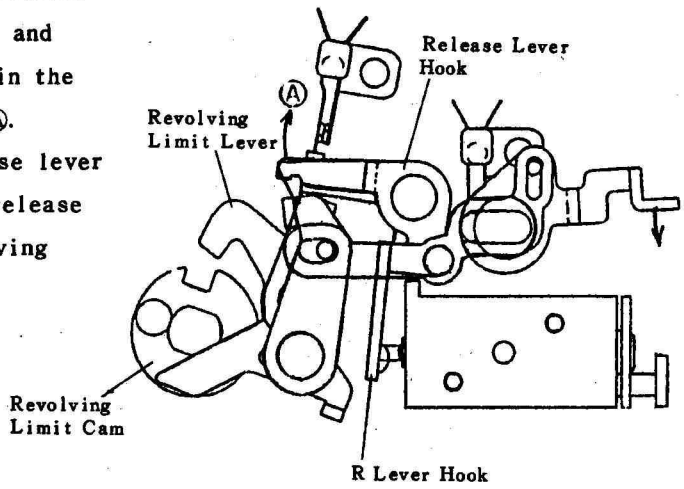
The revolving limit lever, having tripped in the revolving limit cam, keeps the sprocket stopped. In the case other than midway rewinding, the revolving limit lever is disengaged from the revolving limit cam and the cam is in a random position.



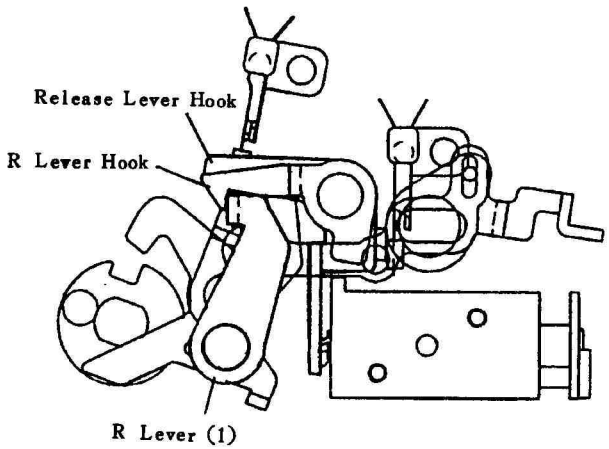
② When the rewind lever is moved, the R coupling plate (2), R coupling plate (1) and R lever move and the R lever pushes up the sloped surface of the R lever hook. Also the pin caulked on the R lever starts disengaging the revolving limit lever from the cam.



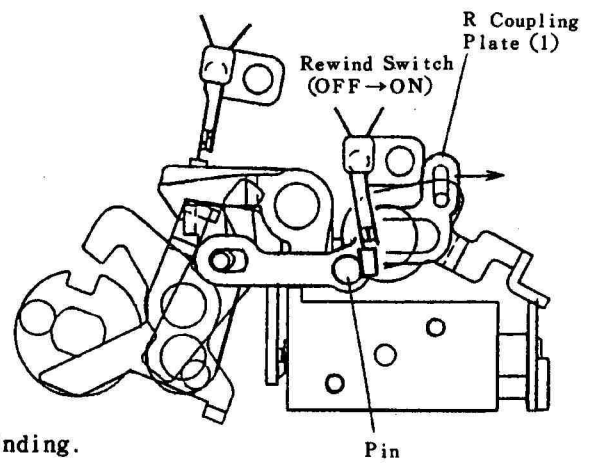
③ When the rewind lever is moved further, the R lever hook and release lever hook turn in the direction of the arrow Ⓐ. Then the revolving release lever is disengaged from the release lever hook and the revolving limit lever is from the revolving limit cam.



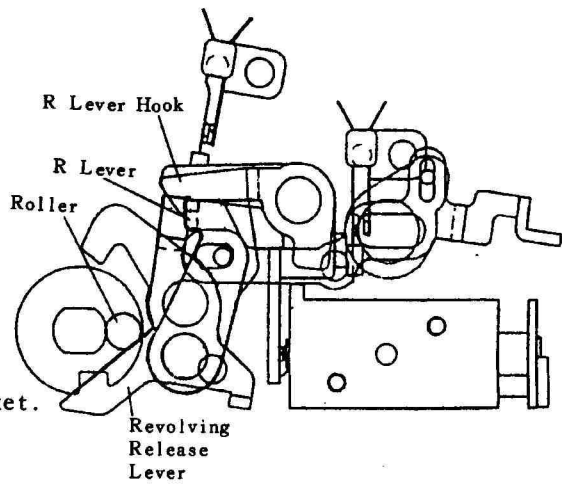
④ When the rewind lever is moved further, the R lever is caught by the R lever hook. At the same time, the clutch lever (see page A–11) is moved to disengage the clutch between the motor and spool.



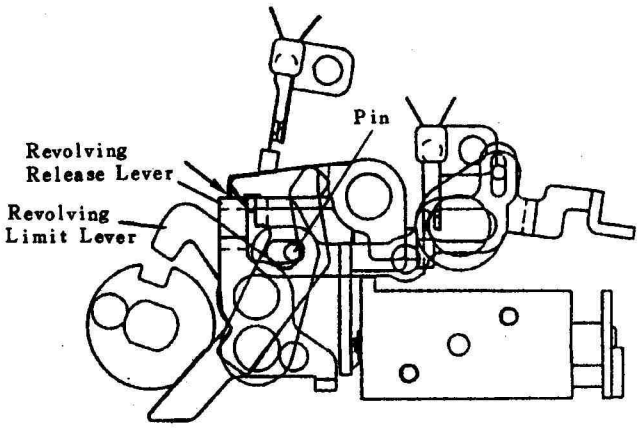
⑤ When the rewind lever is moved further, the spring between the R lever and the R coupling plate (1) is elongated and the R coupling plate (1) moves to the right. Then the pin caulked on the R coupling plate (1) turns on the rewind switch. The "ON" signal from the rewind switch turns on power to the rewind motor to start winding.



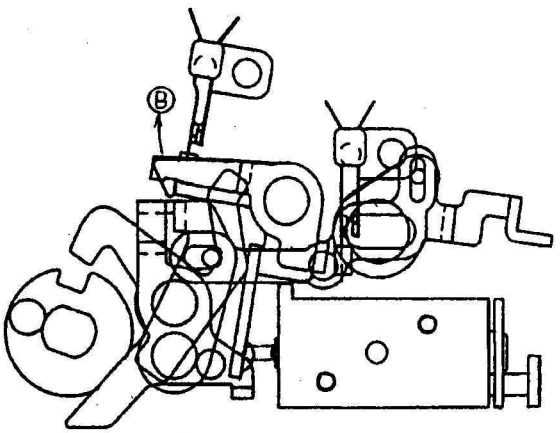
⑥ The rewind lever, when released from your hand, returns to the initial position by the effect of the spring.
However, rewinding state is kept by the R lever caught by the R lever hook. As rewinding has been started, the sprocket is driven by the moving film and the revolving release lever is charged by the roller on the sprocket.



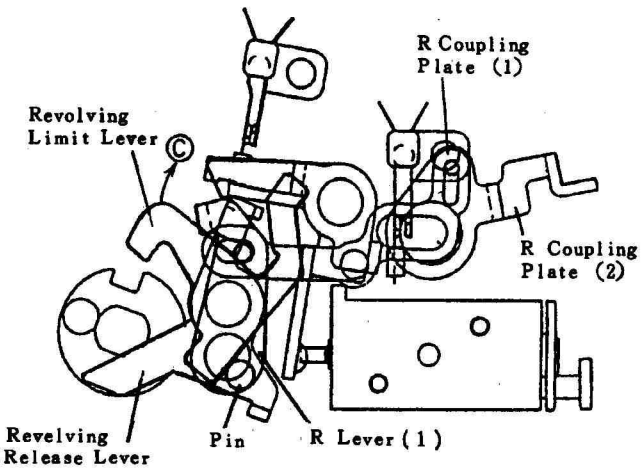
⑦ The revolving release lever is completely charged and caught by the revolving release lever hook. At this point, the revolving limit lever, held by the pin caulked on the R lever, does not trip in the revolving limit cam.
Under these conditions, rewinding is continued until the film comes off the sprocket. During this operation, the rotation of the sprocket is checked by the encoder connected to the sprocket and gears.



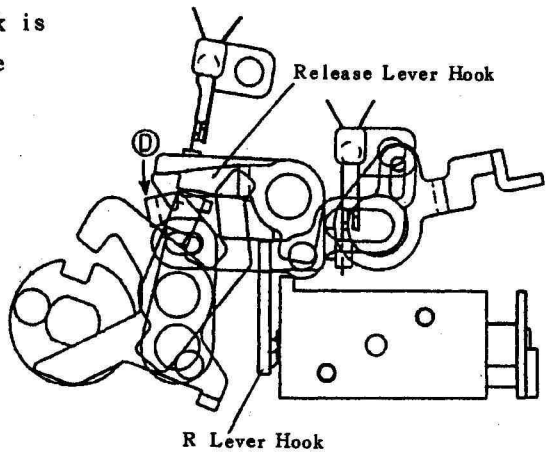
⑧ After completion of rewinding and film replacement, the system returns from rewind mode to winding mode at start of auto loading. When the solenoid plunger is activated, it pushes the R lever hook and then the R lever hook and release lever hook turns in the direction of the arrow Ⓑ.



⑨ When the release lever hook is disengaged. the pin caulked on the revolving release lever pushes the revolving limit lever to turn it in the direction of the arrow Ⓒ. The R lever hook is disengaged and the R lever (1), R coupling plate (1) and the R coupling plate (2) return.



⑩ When power to the solenoid plunger is shut off, the R lever hook and release lever hook is turned by the spring in the direction of the arrow Ⓓ.



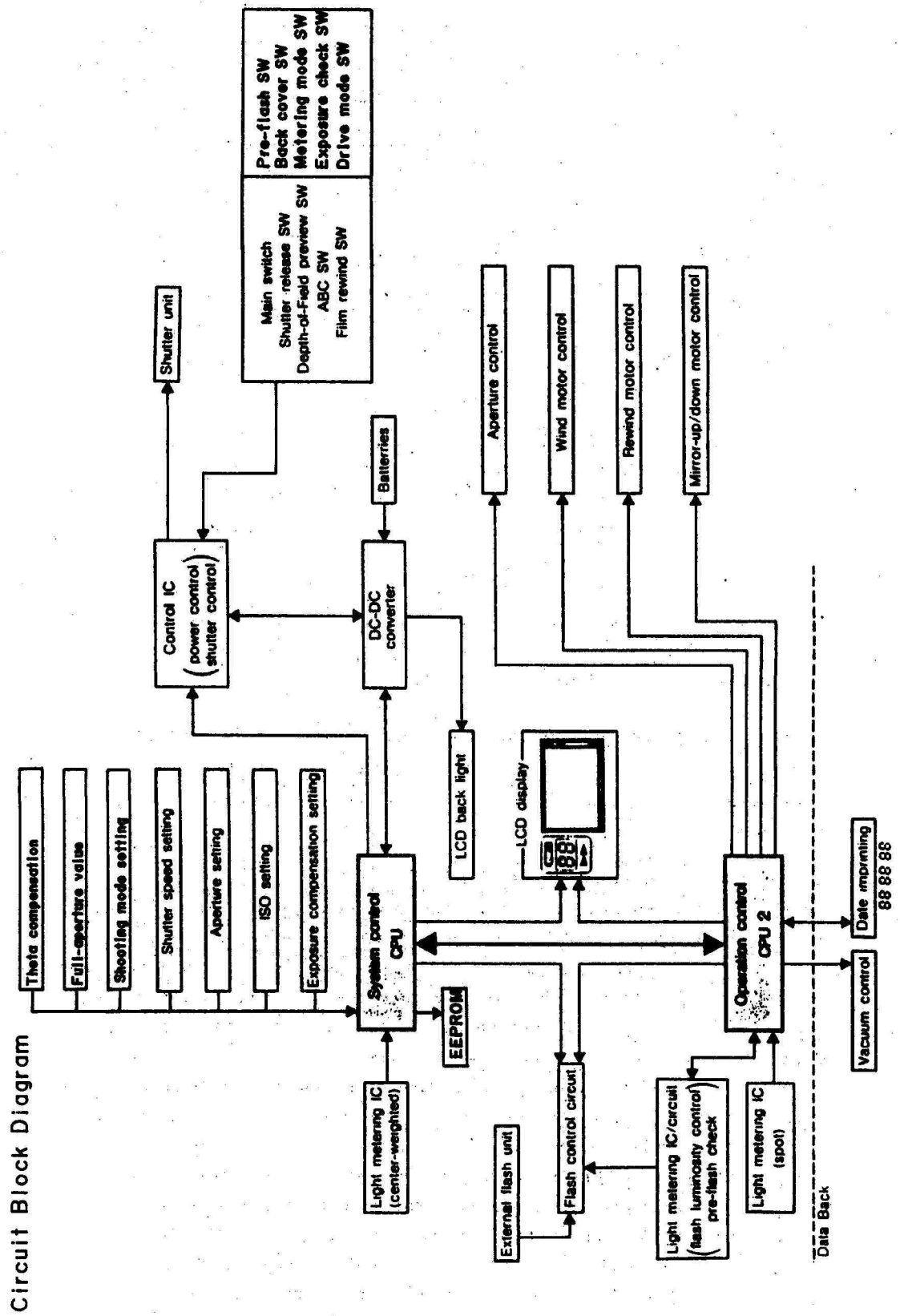
1. Electronic Circuit

The electronic circuit consists of the system control CPU, CPU for controlling mechanical operations acording to the command by the system control CPU, spot metering IC, center-weighted average metering IC, IC for pre-flash TTL spot metering and direct TTL flash metering, data memory EEPROM, power and shutter control ICs, motor drive IC, and LCD panel and back light EL (Electro Luminescence). Commands and data are exchanged via a 4-bit data bus between the CPUs and between the system control CPU and each control IC or by serial transmission between the system control CPU and the EEPROM. The measured data by the metering IC and sampled every 1.25 milliseconds and averaged to optimize metering. Sixteen seconds after power-on, the light metering circuit is automatically turned off for power saving. Therefore, the user need not be nervous about turning off the main switch. For each operation, however, the metering-on time of 16 seconds is renewed when, during power-on of the metering circuit, settings are changed by operating the preset aperture ring, shutter speed setting dial, exposure compensation dial or ISO dial, or preview operation or pre-flash spot metering is performed. Also the AE lock value and the measured value by pre-flash metering are stored in EEPROM so that the data are kept even after power-off of the metering circuit.

Measured values and all other data, including the analog signals for pre-flash metering and battery check level, are adjusted by the digital adjusting system, without using any variable resistance for adjustment.

And the adjusted data are stored in the EEPROM. Also the adjusted data are processed by the CPU for use as control data to assure a high-precision and reliable system.

Circuit Block Diagram



Switch Functions inside the Camera

No.	Switch name	Function
S1	Mirror-up switch	Turns ON at completion of mirror-up, Mirror-up motor is stopped at detection of ON
S2	Charge switch (timing switch)	Turns ON during charge (mirror-down) and OFF at completion of charge. Completion of charge is detected at ON→OFF of this switch.
S3	Aperture open switch	Thrns On when automatic aperture stop down lever is in open position. Detects open position of aperture at power on. Detects completion of aperture return in aperture control at preview or flash metering.
S4	Aperture close switch	Turns ON when automatic aperture stop down lever is in fully closed position. Detects completion of aperture stop down in aperture control at preview or flash metering.
S5	Singl-revolution switch	ON when singl-revolution limit lever is in lock position, and turns OFF when limit lever is relessed by operation of single-revolution plunger. Detects completion of release which takes place immediately before winding.

Aperture open switch/Aperture close switch

(See the drawing on the next page.)

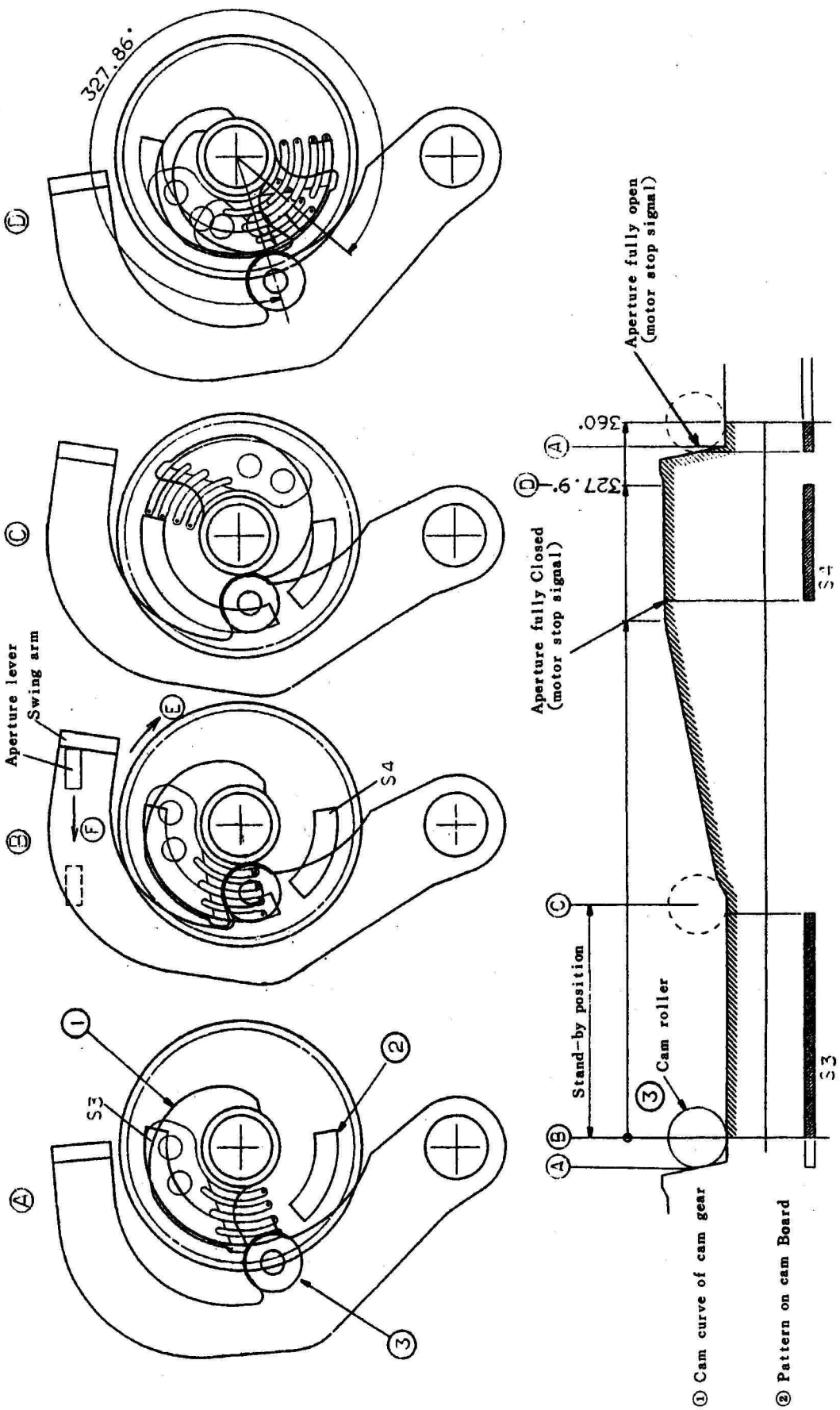
* The aperture open switch/aperture close switch contact is caulked to the cam gear. The relative position of the contact to the pattern position or the cam base plate determines whether it is the aperture open switch or the aperture close switch.

① The cam gear is on stand-by at Ⓑ and Ⓒ.

② With the preview switch turning on, the rewinding motor rotates clockwise, then the cam gear is rotated via a gear train in the direciton of the arrow Ⓔ. The contact rotates together with the cam gear, moving the swing arm in the direction of the arrow Ⓕ. The aperture lever, pushed by the swing arm, rotates in the clockwise direction of the aperture ring, thus causing the aperture blades of the lens to close in (See Fig. 144).

③ At the fully closed position, the aperture close switch (S4) turns on, the CPU2 detects the motor stop signal, and the rewinding motor stops. Ⓒ→Ⓓ

④ As the preview switch turns off, the rewinding motor rotates is the clockwise direction. This rotates the cam gear in the direction of the arrow Ⓔ via a gear train, and the cam roller enters the bottom (Ⓐ position) on the cam surface of the cam gear.
Simultaneously with this, S3 turns on, the CPU2 detects the motor stop signal, and the rewinding motor stops. With the cam roller in position Ⓐ, the aperture is fully open.



System Outline

The principal IC's used in the camera control circuit are as follows:

CPU1 : System control
CPU2 : Mechanism control, flash control
C-IC : Power control, port extension, shutter control
Metering IC2 : Center-weighted average metering
Metering IC2 : Spot metering
Flash light control IC:Flash light control
EEPROM : Storage of adjusted values and camera status data
DC-DC Converter : Stabilized voltage output, EL drive voltage output

CPU1 and CPU2 are one-chip microcomputers of the same type with built-in AD converter, LCD driver and serial interface. EEPROM is an electrically erasable programmable read only memory.

Power supply

Supply voltages are VCC, which is battery voltage stabilized by a 3-terminal regulator (output: 5.2V), and VDD, which is DC-DC converter output. VDD will be 4.6 to 5.2V if the battery voltage is 3.5V or over.
As long as batteries are in, VCC is present irrespective of power on or off of the camera. VDD, which is a voltage present only when the power of the camera is ON, is controlled by the C-IC (refer to section on C-IC).
Since VDD and VCC are connected via a diode, VDD=VCC while VDD is being output (the camera power is ON).
The IC's operating on VCC are CPU1 and C-IC while other IC's run on VDD.

System operation

CPU1 performs the system control of the camera. CPU1 controls the exposure mode, drive mode, metering mode, pre-flash function, ABC function and other functions of the system as a whole, and performs calculations for the respective modes and functions.
Center-weighted average metering data are read by CPU1, and spot metering data by CPU2. The spot metering data are sent from CPU2 to CPU1.
Various switch settings and dial information are read by CPU1 and C-IC. The C-IC sends the input information to CPU1 in response to the command from CPU1.
The ISO information and preset aperture stop down value are subjected to resistance division, and the divided voltages are taken in by CPU1 through AD conversion.
Based on the information thus obtained, CPU1 performs all the processings of metering calculations, shutter control and selection of mechanism operations.
CPU2 performs a series of shutter sequence control, such as preview action, RTV control relative to 5 frames per second, mirror-up and aperture control, as well as issuance of data back imprinting commands.

Flash control

Flash light control is carried out by the flash light control IC under the control of CPU2, "Over/Normal/Under" in this control is detected by CPU2, and the analysis result sent to CPU1, CPU1, in turn, processings a calculation on this value and display its result.
Light emission in pre-flash is accomplished with CPU1 controlling the triac. As for the flash at shooting, a first curtain synch. flash is caused by the X-synch. hot-shoe within the shutter unit, and a second curtain synch. flash by the AX signal of CPU1. X-synch. and AX signal are both output at the moment of shooting. Selection between the second curtain synch. or the first curtain synch. is made by the flash unit. Accordingly, the second curtain synchronized flash is only possible when the dedicated flash unit is used.

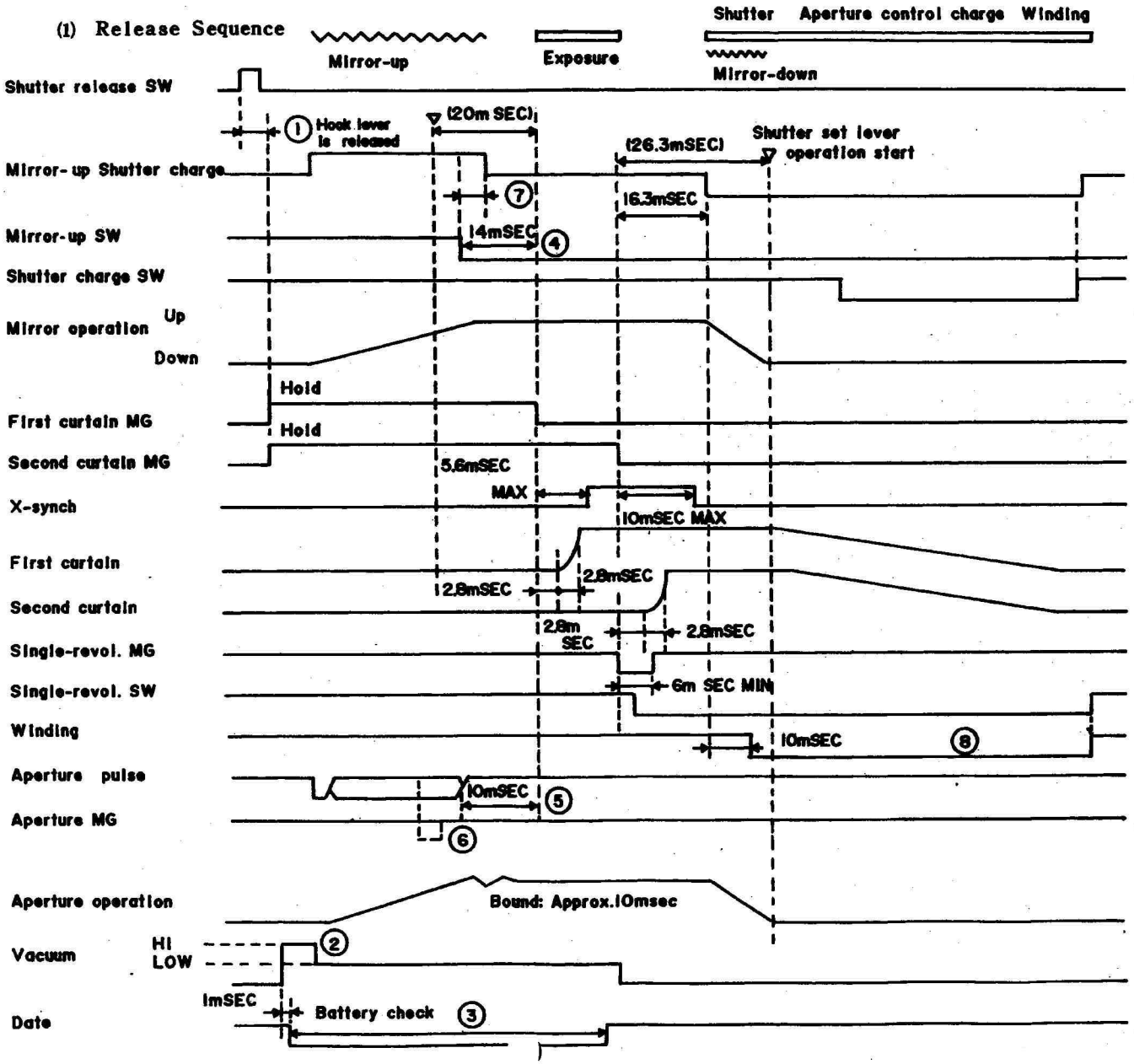
Display

The viewfinder display consists of a transparent LC (Liquid Crystal) panel and EL back light. The LCD is driven by the LCD driver built into the CPU. LCD drive is based on 3-time-division 1/3 duty. The shutter time LCD is controlled by CPU2, and the aperture LCD (lower part of viewfinder) by CPU1.

The EL is driven by a. c. high voltage. The a. c. high voltage is generated by the DC-DC converter with clock provided by CPU1.
The external LCD display is a reflection-type LCD connected in parallel with the film counter of the viewfinder display.

Sequence Time Charts

(1) Release Sequence



① Switch detection, metering calculation, approx. 5 msec

② Vacuum H 1 time: changes with supply voltage.
No vacuum operation without film.

③ Date imprinting time: changes according to ISO value

ISO	6400~200	(200)~25	(25)~6
msec	30	60	120

NO output, as a rule, of imprint signal without film.

④ 14 msec after mirror-up switch ON, or

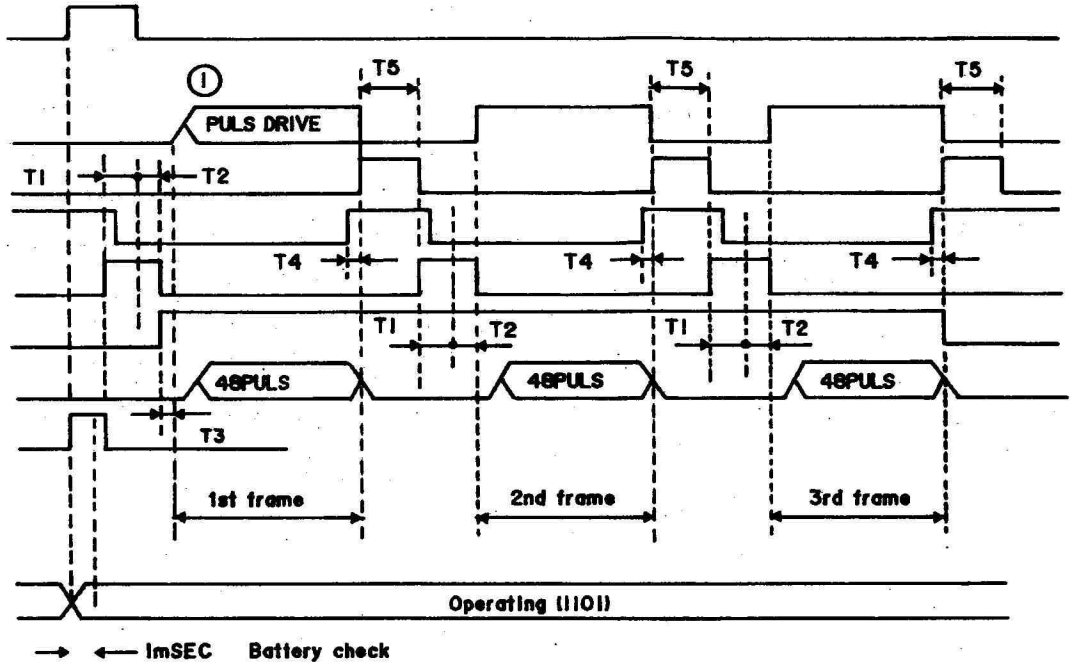
⑤ 10 msec after output of specified aperture pulse count, First curtain magnet OFF at whichever later

⑥ Aperture operation controlled by aperture magnet in TV mode

⑦ Supply voltage 5.2 V or above 6msec
5.2 V or below 11 msec

⑧ Left chart represents case for drive mode CH.
At CL, winding takes place after completion of charge.

(2) Auto Loading Control



T1: Single-revol.MG OFF delay 5 msec

T2 Single-revol. SW LOW decision 1 msec

T3: Sprocket SW photointerupter LED ON delay 100 μsec

T4: Single-revol. SW (LOW→) HI decision 1 msec

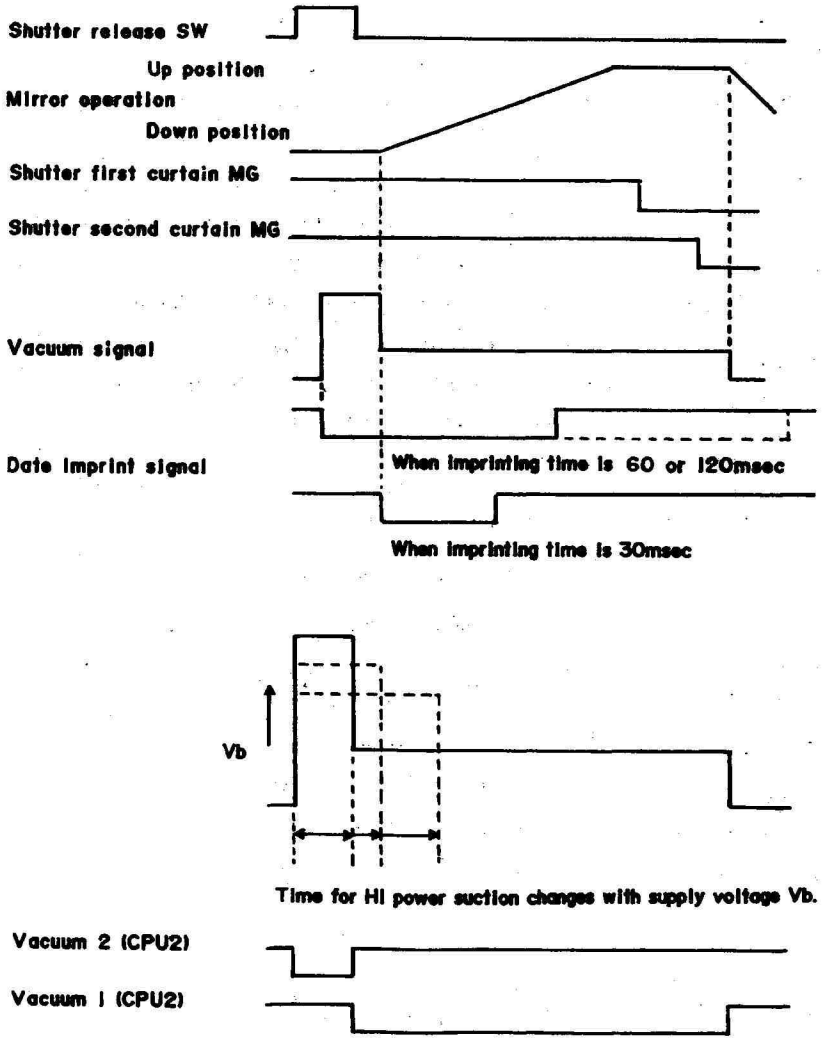
T5: Winding motor brake time 5 msec

① : Supply voltage

Below 6.5V : DC drive

Above 6.5V : Pulse drive up to 425 msec of drive time, the DC drive up to 800 msec of operation limit time

(3) Vacuum Operation, Date Imprinting



Date Imprinting

o Normally, during drive of S, LC, CH, S2 or S10, date signal turns ON before mirror-up for time corresponding to ISO as shown below. When imprinting time of 30 msec has been selected however, date signal turns ON after vacuum has switched from HI to LOW.

o When drive mode is multiple, date imprinting is done only for 1st release of multiple exposure (no repeated imprinting).

ISO	6400~200	(200)~25	(25)~6
msec	30	60	120

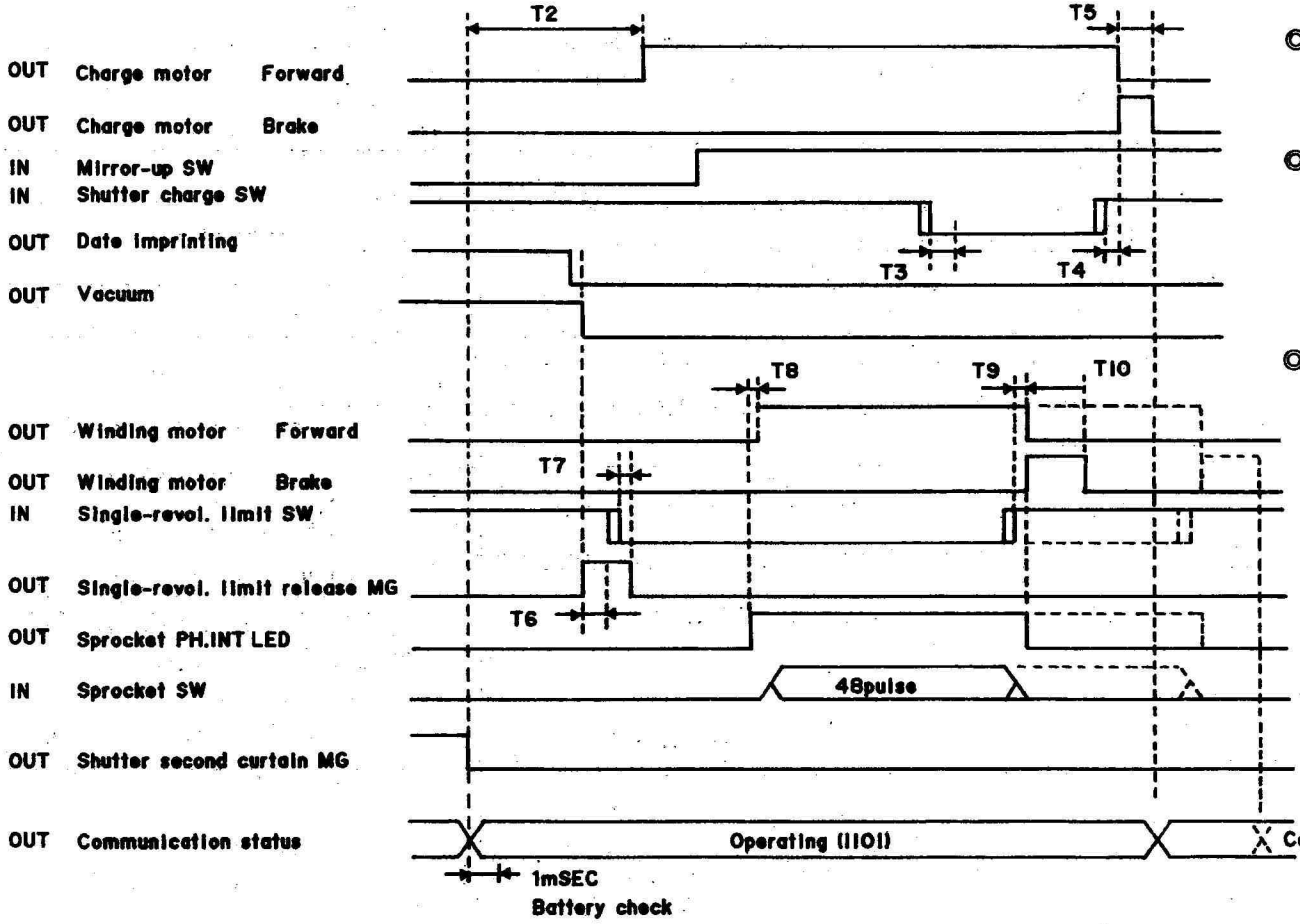
Vacuum

This film suction control performs 2-stage control of suction plunger force.

Initially HI power suction time is determined according to supply voltage Vb read at battery check before operation. Then the voltage is switched to voltage necessary to keep this suction, and suction turns OFF after shutter second curtain has completed its travel.

* As a rule, vacuum operation and date imprinting are not performed without film.

(4) Winding Control (CH mode (high-speed))



◎ Received command

o Winding (CH) 1110

◎ Status

Command wait status is returned on completion of both and shutter charge (mirror-down) and winding.

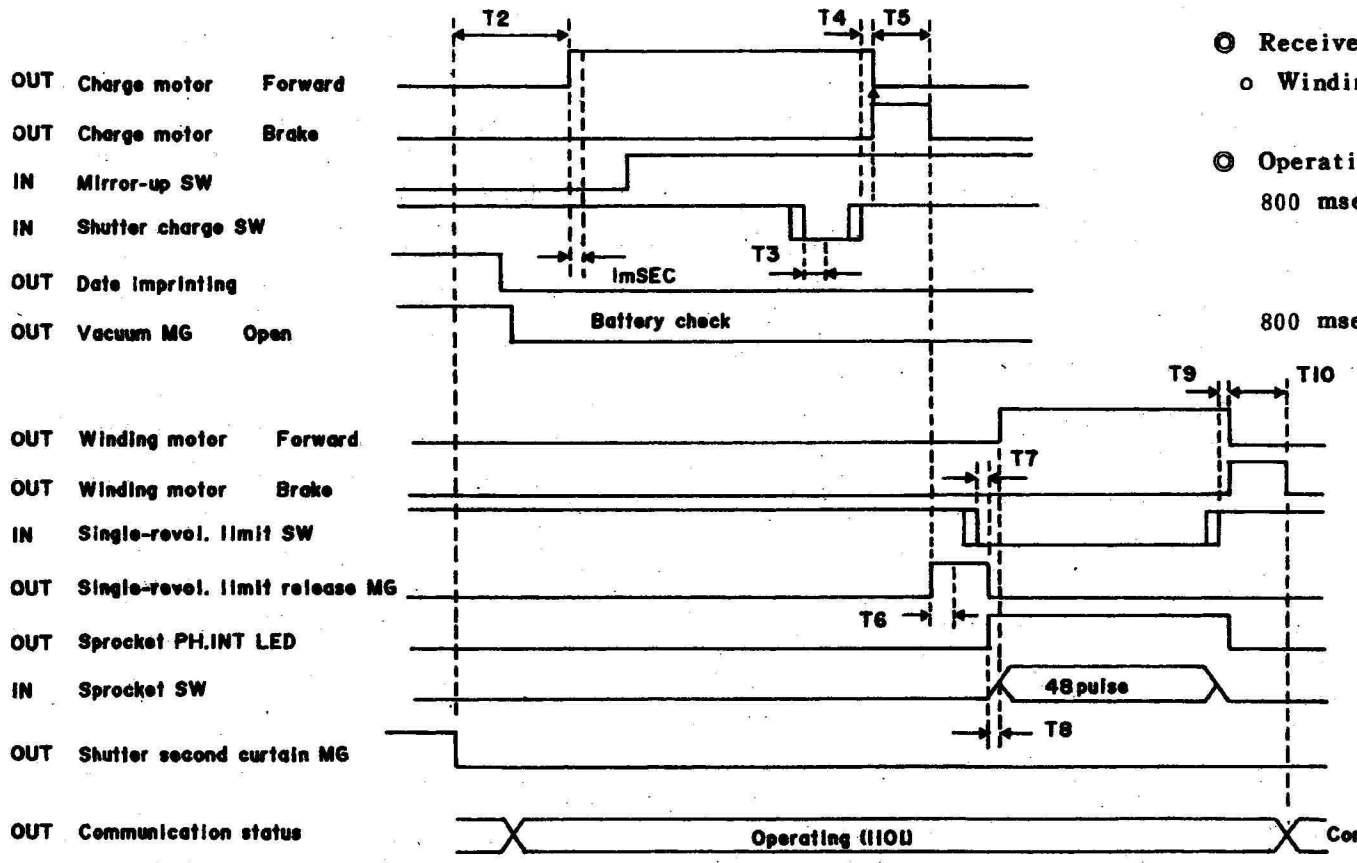
◎ Operation limit (Error detection)

Both shutter charge and winding must complete within 800 msec from start of charge operation.

T2: Shutter regulation ensuring 16.3 msec
T3: SW LOW decision 5 msec
T4: HI decision 1 msec
T5: Charge motor brake time 5 msec

T 6:	Single-revol. MG	OFF delay	5 msec
T 7:	Single-revol. SW	LOW decision	1 msec
T 8:		HI decision	1 msec
T 9:	Photointerrupter LED	response	100 μsec
T10:	Winding brake time 5 msec		

(5) Winding Control (CL mode (low-speed))



◎ Received command

o Winding (CH) 1101

◎ Operation limit

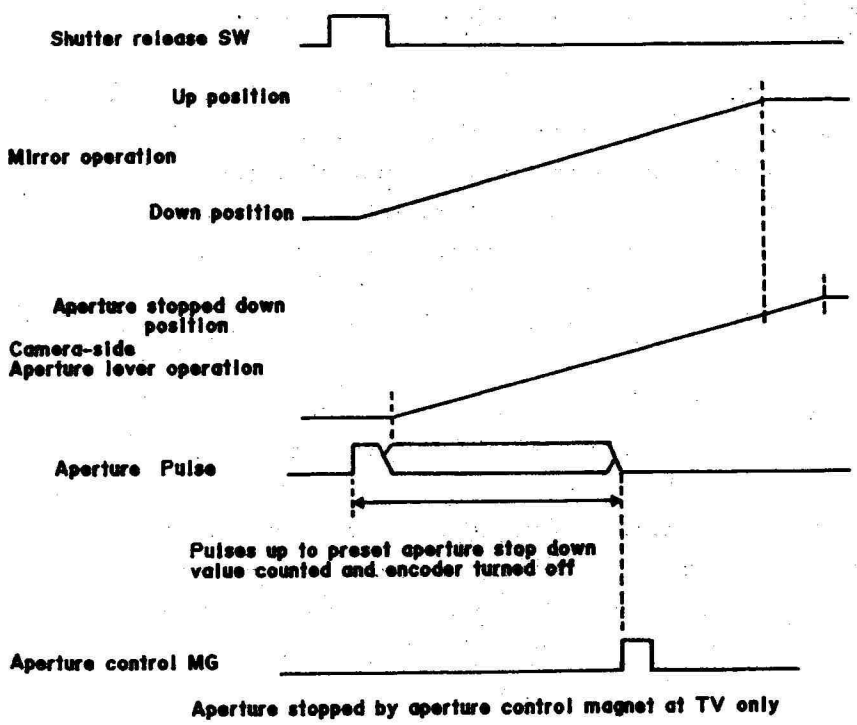
800 msec: from start of charge motor forward run to charge switch HI→LOW

800 msec: from start of winding to single-revol. switch LOW→HI

T2: Shutter regulation ensuring 16.3 msec
T3: SW LOW decision 5 msec
T4: HI decision 1 msec
T5: Charge motor brake time 5 msec

T 6: Single-revol. MG OFF delay 5 msec
T 7: Single-revol. SW LOW decision 5 msec
T 8: decision 1 msec
T 9: Photointerrupter LED response 100 μsec
T 10: Winding brake time 5 msec

(6) Aperture Control



Aperture lever operates almost simultaneously with mirror-up, and aperture pulse is output from aperture encoder. Control is performed by counting this pulse.

In AV, M or B mode

Pulses based on aperture stop down value set by aperture ring of lens are counted, and encoder is turned off upon confirming that aperture has stopped down the settings. Aperture magnet is not controlled.

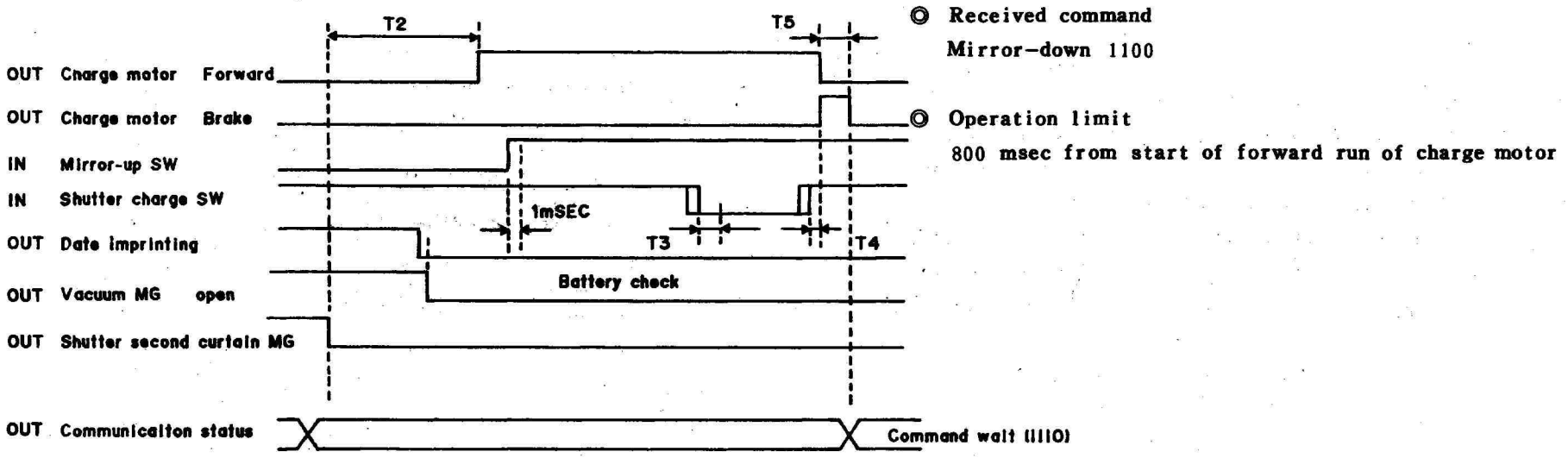
8 pulses/1 stage (per aperture)

In TV mode

Pulse count up to operation of aperture magnet is determined from the aperture pulse count of aperture stop down value as determined by metering result and the operation delay pulse count of aperture control magnet measured by adjusting device beforehand. According to this value, amount of aperture operation is counted, magnet is operated and aperture is stopped at regulated position.

(7) Mirror-down Control

(mirror-down & shutter charge operasion only (multiple))



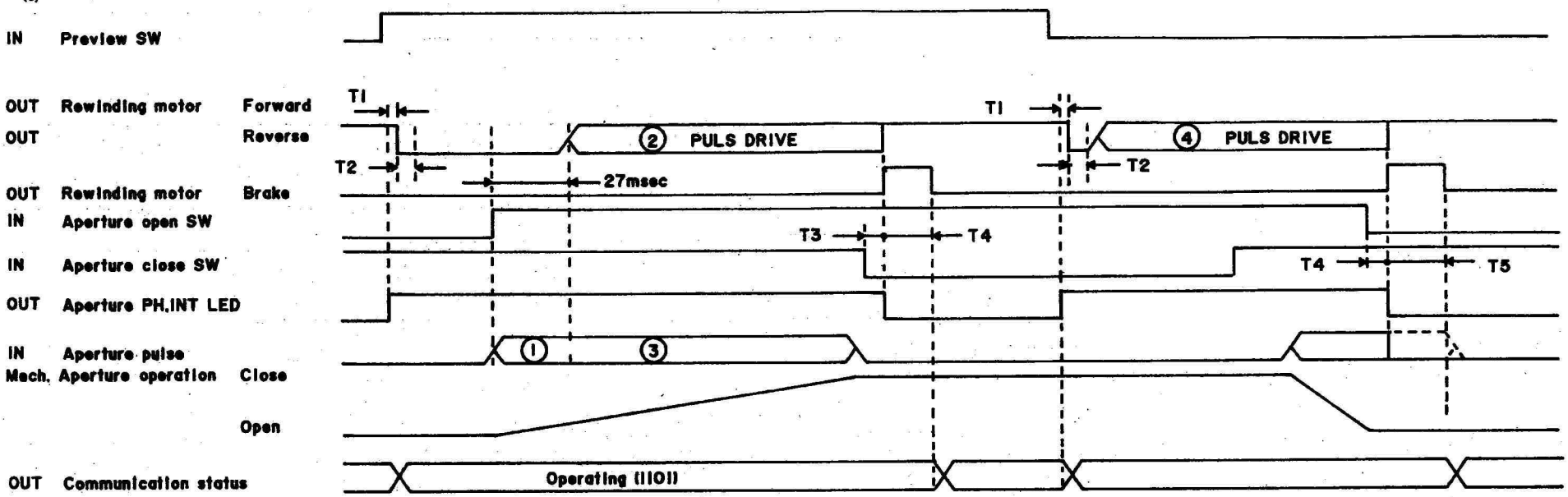
T2: Shutter regulation ensuring 16.3 msec

T3: SW LOW decision 5 msec

T4: HI decision 1 msec

T5: Charge motor brake time 5 msec

(8) Preview



T1: Aperture photointerrupter LED response time delay 10 μsec
T2: Battery check timing 1 msec
T3: Aperture stop down SW On decision 1 msec
T4: Rewinding motor brake time 50 msec

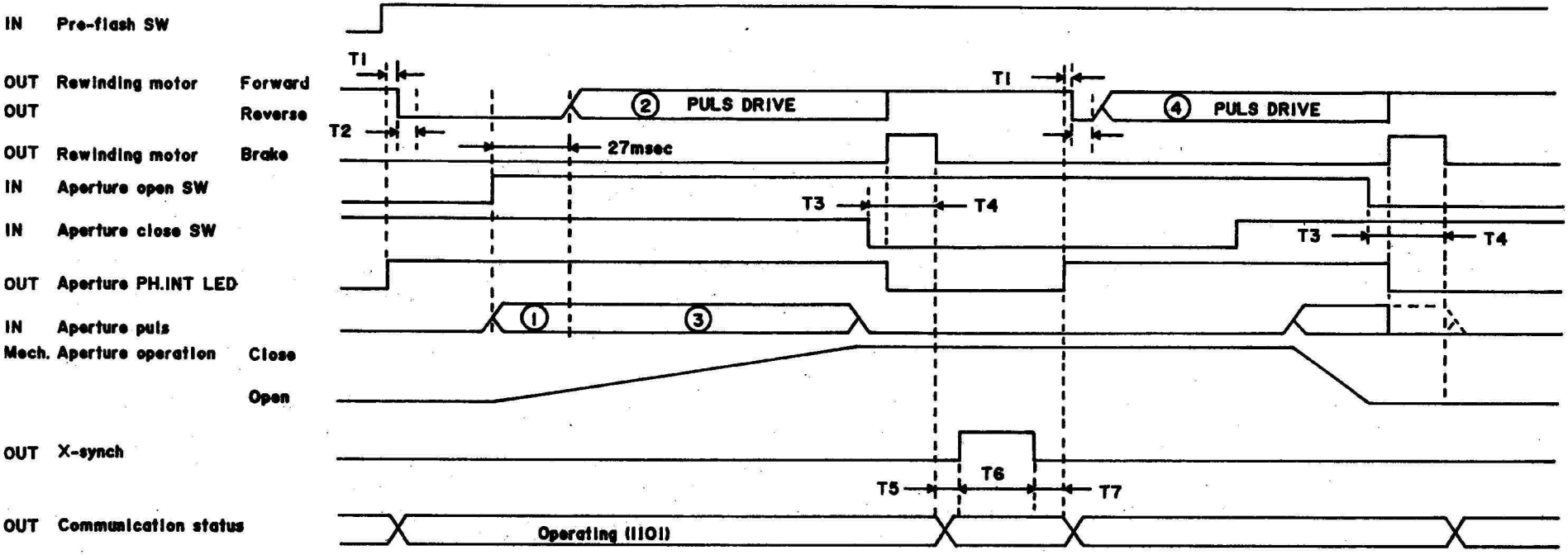
Preview close operation

① Aperture pulse count is output within 27 msec from aperture open switch OFF.
② Pulse drive ON and OFF (duty) times are determined according to above aperture pulse count.

Preview open operation

③ Pulse drive ON and OFF times (duty) are calculated, using value determined ② of preview close operation.
(ON time: about 1/4)
Also, output pulse (③) is detected during pulse drive, and speed is controlled.

(9) Pre-flash



T1: Aperture photointerrupter LED response time delay 100 µsec
T2: Battery check timing 1 msec
T3: Aperture stop down SW ON decision 1 msec
T4: Rewinding motor brake time 50 msec
T5: Flash control start command communication 2.5 msec
T6: Shutter time (max. 30 msec)
T7: Flash metering data communication, Preview Open Communication. 2 msec

Preview close operation

① Aperture pulse count is output within 27 msec from aperture open switch OFF.

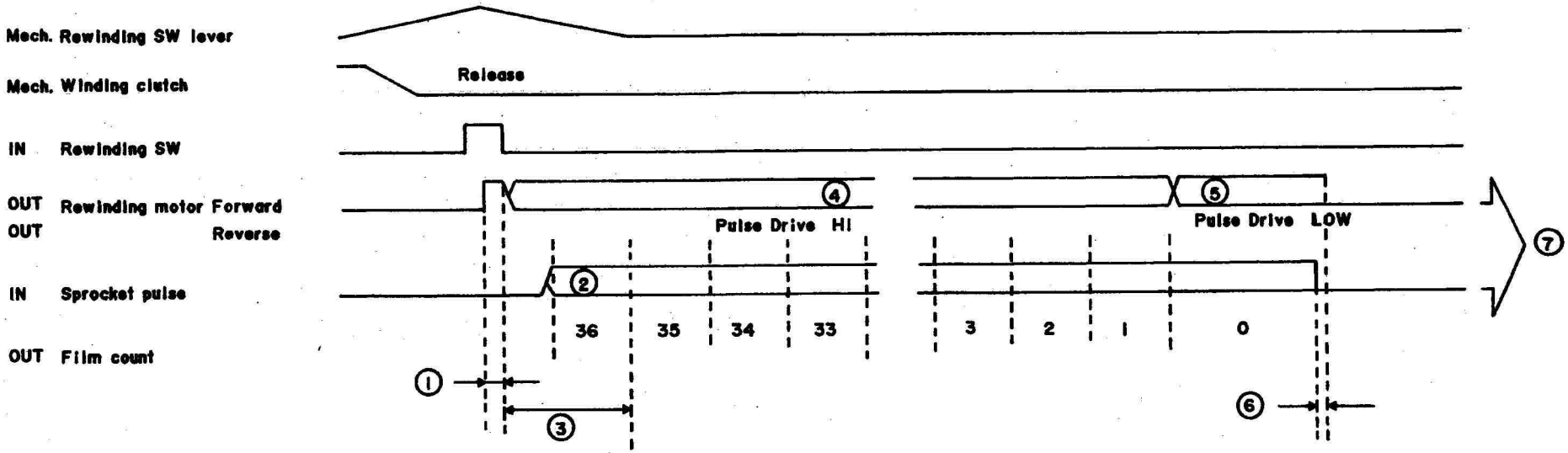
② Pulse drive ON and OFF (duty) times are determined according to above aperture pulse count.

Preview open operation

④ Pulse drive ON and OFF times (duty) are calculated, using value determined in 2 of preview close operation.
(ON time: about 1/4)
Also, output pulse (③) is detected during pulse drive, and speed is controlled.

Flash metering data during pre-flash SW ON are stored and flash metering display is made. Flash control is performed accordingly at release.

(10) Rewinding



① Battery check is made 1 msec after motor ON.

② 48 pulses are for one frame.

③ For 3 seconds from drive start of pulse drive HI, pulse output for one frame(48 pulses) is waited to take up film winding slack.

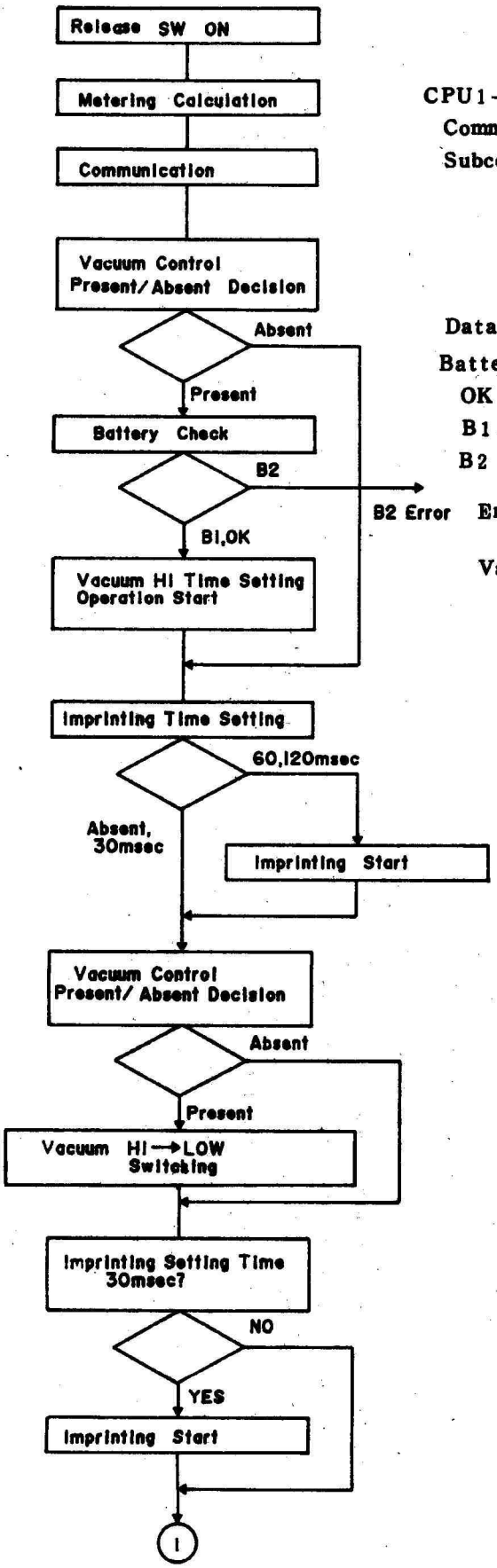
④ ⑤ Drive speed: pulse drive HI > pulse drive LOW
(Pulse drive HI is nearly of DC drive.)

⑥ Without pulse output for 50 msec, rewinding ends as Film End.

⑦ Preview Close→Open operation causes return of epicyclic gear.
(Refer to section on preview.)

Circuit Control

(1) Release Sequence Flowchart CH Mode



CPU1→CPU2

Command : Mirror-up

Subcommand: Aperture control Present/Absent

Present: TV

Absent : B, M, AV

Vacuum Present/Absent

Date imprinting Absent/30/60/120 msec

Data : Aperture pulse count

Battery check

OK : 4.5V and above

B1 : 4.5 – 4.2V

B2 : 4.2V and below

B2 Error Error processing: Operation halt, Display: Battery mark flashing

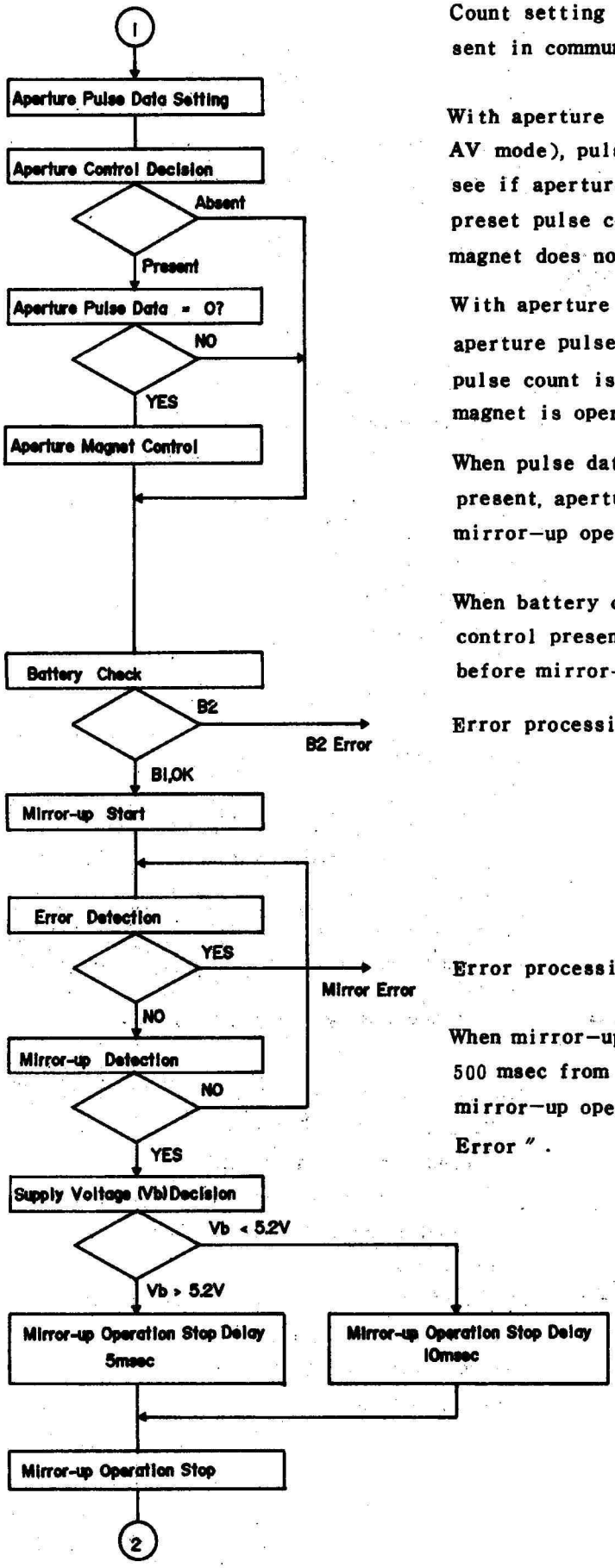
Vacuum: HI time changes with supply voltage Vb.

Vacuum operation is not done without film.

Date imprinting time: Changes with ISO value.

None without film

ISO	6400~200	(200)~25	(25)~6
msec	30	60	120



Count setting for pulse counting based on sent in communication

With aperture control absent (in B, M or AV mode), pulse counting only is done to see if aperture has operated according to preset pulse count, and aperture control magnet does not operate.

With aperture control present (in TV mode), aperture pulse is counted, and when preset pulse count is reached, aperture control magnet is operated to stop aperture.

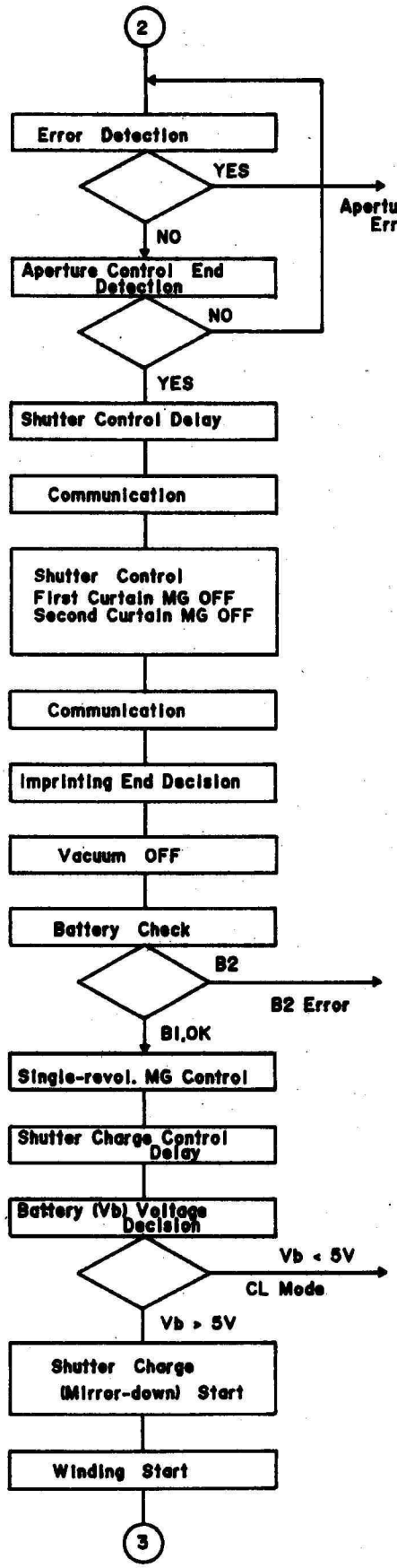
When pulse data is 0 with aperture control present, aperture magnet is operated before mirror-up operation.

When battery check is done with vacuum control present, there in no battery check before mirror-up start.

Error processing: Operation halt

Error processing: Operation halt

When mirror-up can not be detected within 500 msec from start of mirror-up operation, mirror-up operation is halted as "Mirror Error".



When aperture control end can not be detected within 500 msec from start of mirror-up operation, aperture end detection is halted as "Aperture Error".

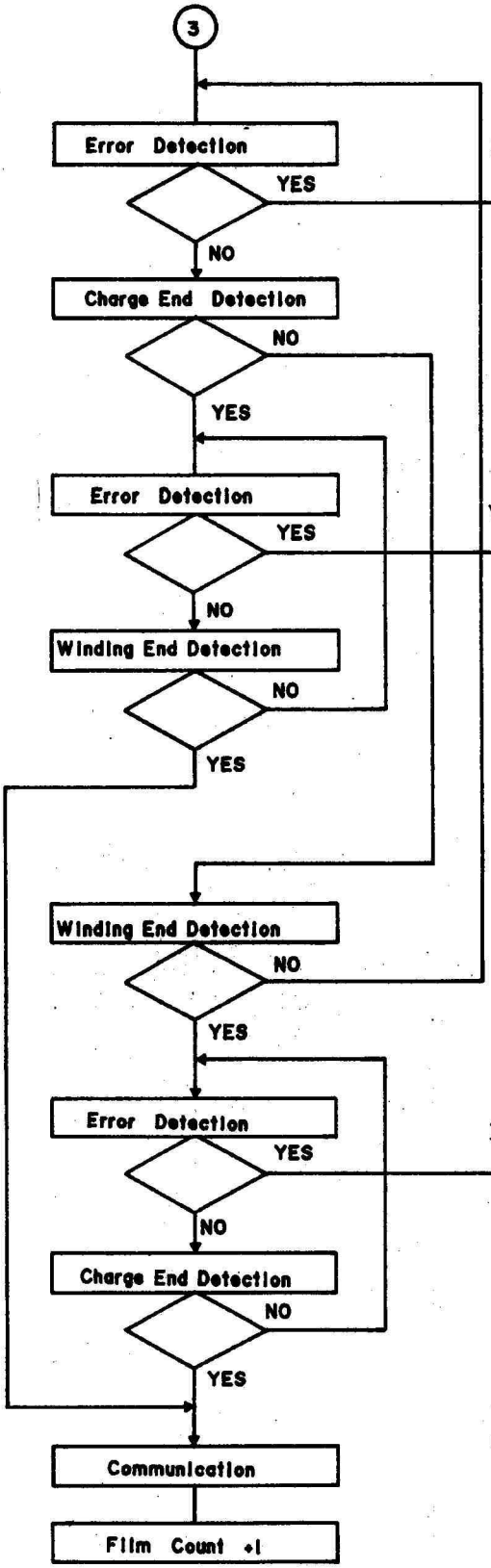
Error processing: Operation halt

Shutter control delay: Sutter first curtain magnet OFF is delayed at least 20 msec from shutter mechanism hook lever release.
(Approx. 15 msec after mirror-up detection)

CPU2→CPU1
Mirror-up control end, Command wait status output

CPU1→CPU2
Command: CH (winding)
Without film, winding is not done in all drive modes (MULTI, B, M, S, CL, CH, S2, S10).
There is only charge (mirror-down) operation (command: mirror-down) irrespective of dial setting.
Error processing: Operation halt

Shutter charge control delay:
Delayed at least 26.3 msec from shutter second curtain magnet OFF.
(16.3 msec delay from shutter second curtain magnet OFF from charge motor drive start)
Even if drive mode dial is set at CH, it will be automatically switched to CL if battery voltage is 5V or below.
(Low power consumption)



Winding Error: When winding does not end within 800 msec from charge start.
Error processing: Operation halt

Winding Error: When winding does not end within 800 msec from charge start.

Error processing: Operation halt

Mirror Error: When shutter charge (mirror-down) does not end within 800 msec from charge start.

Error processing: Operation halt

CPU2→CPU1
CH control end, Command wait status output

C-IC

Outline of Functions

Power for IC operation is Vcc, which is being applied constantly.
In0, which is the reset terminal, is reset when In0=H. Without the batteries removed, In0 is always L.

C-IC performs the following four functions:

1. Power and CPU reset control
2. Communication
3. Extension of input ports
4. Shutter control

of these functions, the OFF→ON control of power (V DD) only is performed by the IC alone. Other functions are operated upon receipt of commands from the CPU.
As V DD goes H, the IC starts oscillation at 4 MHz, and then it keeps operating with 4 MHz as system clock.

1. Power and Reset Control

(1) The ON/OFF control of power to the camera, which is the ON/OFF control of V DD, is done by this IC.

① Power ON

There are 9 ports of power ON input. When any one port undergoes H→L (SW=ON), L(Open Collector) is output to the PH signal and V DD is output from the DC-DC converter.

The power ON input ports are S0 to S8. (See the table for correspondence between ports and switches.)

S0 to S7 operate as power ON switches only when the LOCK terminal is H (=Main SW ON or AE Lock). Hence, with the main switch in the OFF position, the camera will not operate even if the power on switch is pressed.

As the LOCK terminal undergoes a change of L→H (=Main SW OFF→ON), the output of PH signal=L is given.

S8 outputs PH=L at a change of H→L or L→H irrespective of the status of the LOCK terminal.

② Power OFF

When a power OFF command is sent form the CPU,
PH=H (Open Collector=OFF) is output
and the VDD output of the DC-DC converter
turns OFF.

(2) Reset output

The reset control of CPU2 is performed by this IC.

① Reset release (RESET=H)

After the output of a VDD output signal (PH signal), the VDD output voltage of the DC-DC converter is detected. And when this voltage goes above 4.0V, H is output from the RESET terminal.

② Reset

When a power OFF command is sent from CPU1, L is output from the RESET terminal.

2. Communication

Commands and data are received from CPU1, and port statuses of C-IC are transmitted to CPU1.
Communication is performed, using 4-bit data bus(bi-lateral)and 3-bit control line (C-IC input).

(1) Data reception from CPU1

Communication consists of:

{Command: 4 bits} + {Data 1: 4 bits} + {Data 2: 4 bits}

(2) Transmission to CPU1

{Command: 4 bits} + {Data 1: 4 bits} + {Data 2: 4 bits}

3. Extension of Input Ports

This IC has input ports of S0 to S19. The status (L or H) of each port is transmitted to CPU1 upon receipt of readout command from CPU1.
The status is sent in 8 bits (4 bits × 2 by a single command.)

4. Shutter Control

The M1 terminal controls the first curtain magnet, and the M2 terminal the second curtain magnet.

A hold signal (M1 and M2 at the same time) is output immediately before mirror-up.

- For both M1 and M2, a hold is done by a suction of constant current of 22 mA. This current is determined by the resistance between R terminal and GND. That is, the current is 22 mA for 5.6Ωk.
- Because of the constant current drive, the voltage of M1 and M2 at hold varies with the battery voltage. The battery voltage is 4.4V.

First Curtain OFF (MI voltage=battery voltage) is output after completion of mirror-up. Then after a lapse of specified shutter time, Second Curtain OFF (M2 voltage=battery voltage) is output. Refer to the sequence time chart.

C-IC Terminal Functions

Pin-No.	Terminal	Signal	Function
1	DO	DO	CPUI-C-IC data bus
2	DI	DI	CPUI-C-IC data bus
3	D2	D2	CPUI-C-IC data bus
4	D3	D3	CPUI-C-IC data bus
5	C/D	C/D	CPUI-C-IC command/data
6	W/R	W/R	CPUI-C-IC write/read
7	CLK	CLK	CPUI-C-IC communication clock
8	CS		Grounding
9	BCNT		Connection with CHS
10	TRIG		No-connect.
11	MI		First curtain MG. output
12	M2		Second curtain MG. output
13	R		Shutter MG. current resistance
14	BZ		No-connect.
15	RESET	RESETOUT	CPU2 reset output
16	Vcc	Vcc	Vcc
17	InO	InO	C-IC reset input
18	PH	PH	Power hold output
19	TRB	TRB	TRB
20	DCC	DCC	Vdd level detection
21	GND	GND	Grounding
22	125K		No-connect.
23	500K		No-connect.
24	4MHZ		No-connect.
25	XOUT		4MHz oscillator connection
26	XIN		4MHz oscillator connection
27	VDD	VDD	VDD input
28	LOCK	MAIN	Main SW input
29	SO	RELEASE	Release SW input
30	SI	CHECK	Check SW input
31	S2		No-connect
32	S3	TESTI	Test mode input
33	S4	PREVIEW	Preview SW input
34	S5	TEST2	Amp test input
35	S6	REWIND	Rewind SW input
36	S7	S.CUR.COMP.	Second curtain completion SW input
37	S8	BACK COVER	Back cover SW input
38	S9	DRV2	Drive mode 2 input
39	SIO	DRVI	Drive mode 1 input
40	SII	DRVO	Drive mode 0 input
41	SI2	ABCO.5	ABC 1 input
42	SI3	ABCI.O	ABC 0 input
43	SI4	DX	DX-SW input
44	SI5	COMPENS. +	+Compensation SW input
45	SI6	COMPENS. -	-Compensation SW input
46	SI7	MECH. BULB	Mech. bulb SW input
47	SI8	AE LOCK	AE lock SW input
48	SI9	METER SW	AVE/SPOT switching SW input
49	GND	GND	Grounding
50	NC		No-connect.
51	BCNT		Connection with CHS
52	CHS		Connection with BCNT
53	CHC		No-connect.
54	SP		No-connect.
55	LAD		No-connect.
56	NC		No-connect.

Light Metering IC

The light metering IC's of the same time type are used for center-weighted average metering and spot metering.

The center-weighted average metering IC is located in the upper part of the viewfinder, and the spot metering IC in the lower part of the mirror box, both together with their respective optical systems. The light metering IC outputs voltage VO corresponding to the brightness and voltage VREF in proportion to the absolute temperature. VO is the voltage logarithmically compressed within the IC. See the next page for the temperature characteristics of VREF.

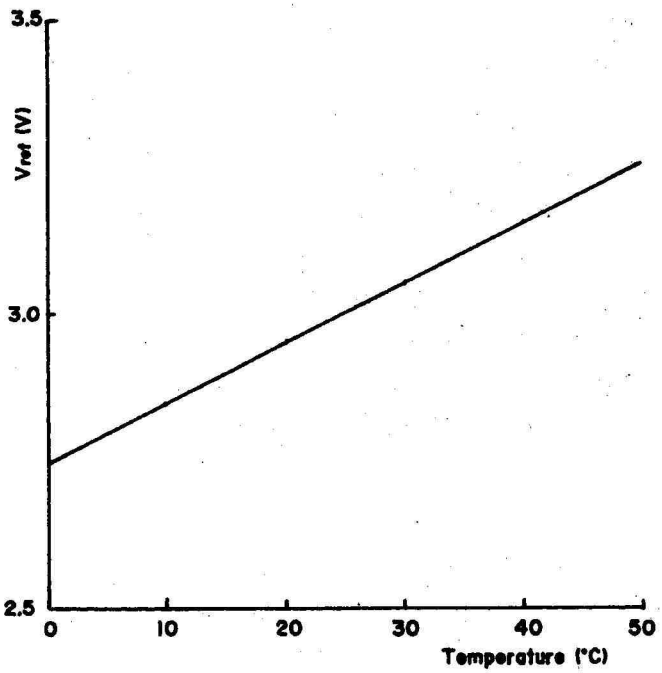
The CPU performs AD conversion using VREF as AD reference voltage (AD result = 256) and uses it as light metering data. Center-weighted average metering is handled by CPU1, and spot metering by CPU2.

VO values are: Temperature = 25°C, Brightness = LV12, lens = 50㎜/F1.4
TYP values are: Center-weighted average metering output: 1.055 V
Spot metering output: 0.863 V

VO changes 90mv for a change in brightness of 1EV. The greater the brightness, the higher the voltage. VO values and their variations are in proportion to the absolute temperature.

Errors of VO VREF as well as those of the optical system are compensated by internal operation of the CPU. As for the adjustment, refer to "exposure reference value/exposure inclination" in the section on adjustment.

Photometry Vref Temperature Characteristics

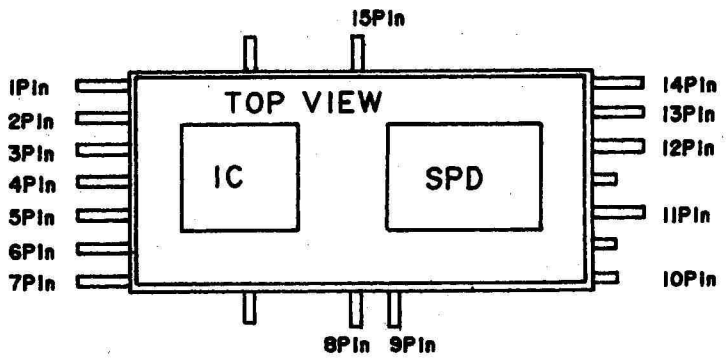


Temp. (°C)	Vref (V)
0	2.75
5	2.80
10	2.85
15	2.90
20	2.95
25	3.0
30	3.05
35	3.10
40	3.15
45	3.20
50	3.25

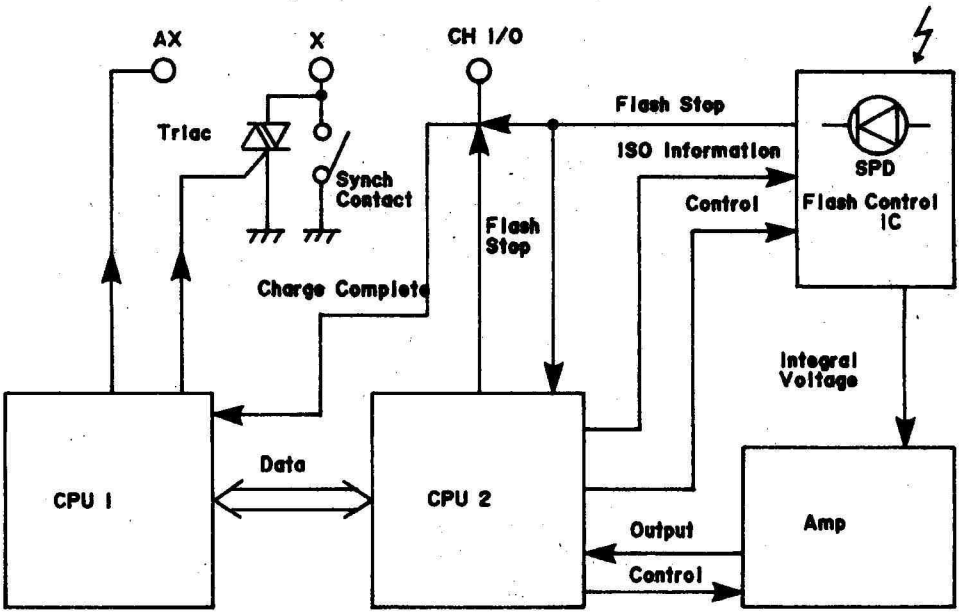
L. Metering IC Terminals

Pin No.	Symbol	Function
1	SEL0	No-connect.
2	SEL1	No-connect.
3	SEL2	No-connect.
4	GND	Grounding
5	PI	No-connect.
6	PULSE	No-connect.
7	VCC	VDD
8	SPDB	No-connect.
9	SPDA	No-connect.
10	SPDD	No-connect.
11	CATHODE	No-connect.
12	SPDE	No-connect.
13	VO	Metering output
14	VREF	AD ref. voltage
15	SPDC	No-connect.

Photometry IC Terminal Arrangement



Pre-flash & Direct Flash Control Circuit



o Direct Flash Control

At the input of charge complete signal in CPU1, the CPU judges it as the setting of flash control mode. A flash is emitted when the shutter release is pressed and the synch contact is closed. In parallel with this, CPU2 performs the control of the Flash light metering IC. The Flash light metering IC integrates the light received by the SPD, makes a comparison with the reference voltage relative to ISO, and stops the emission of the flash. After the stoppage of flashing, the integration is continued for the shutter time. And finally the integral voltage is subjected to A/D conversion, and the result is used as display data.
The same operation takes place also when a flash is emitted at the AX signal with the flash set in the second curtain synch mode.

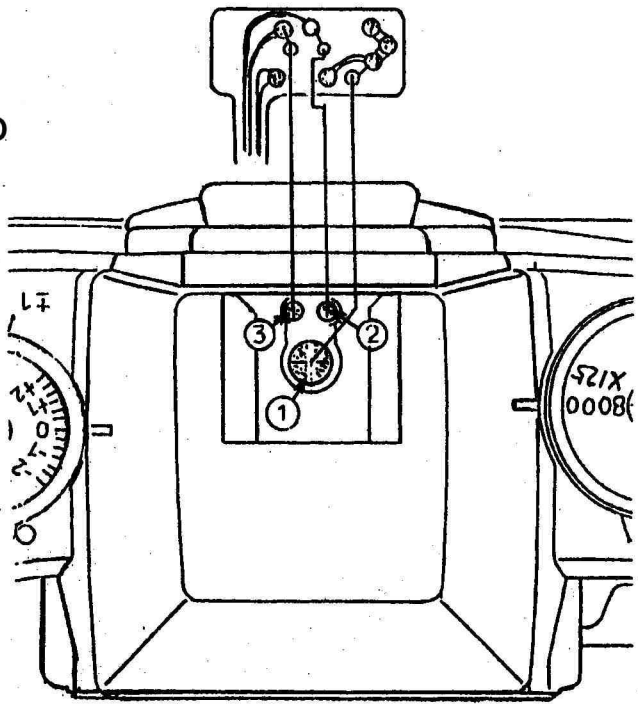
o Pre-flash

When the pre-flash lever is turned on, the CPU judges the presence of charge complete signal input in CPU1 as use of the dedicated flash and its absence as use of a general flash.

With use of the dedicated flash, after the completion of aperture stop down, CPU1 performs the flash control of first curtain synch. and second curtain synch., whereas CPU2 performs the control of the flash control IC and integration the same way as with direct flash control.
With use of a general flash, flash control is first curtain synch. only. And in pre-flash first curtain synch., an flash is emitted by turning on the triac connected in parallel with the synch control.
In ten pre-flash function, the CPU carries out not only the A/D conversion of integral voltage but also the meaurement of time from flash start to end.
In flash photography with the pre-flash lever on, flash control is not done, but the time above is used to stop each flash.

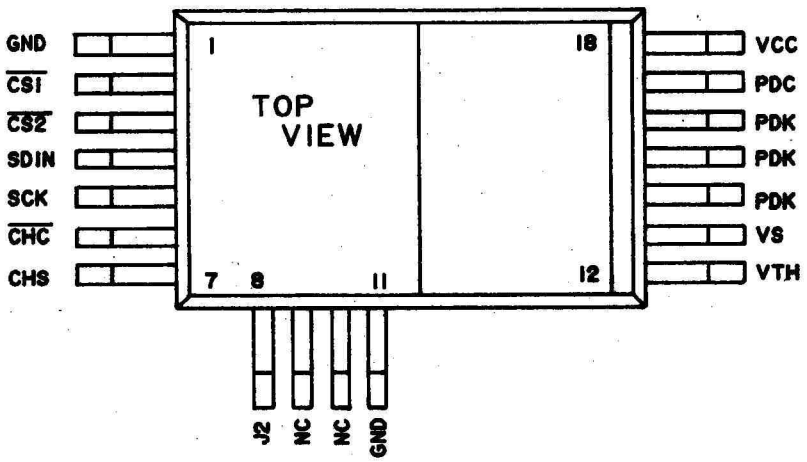
Hot-shoe terminal

① X
② AX
③ CH I/O



Flash Control IC Pin Assignment and Terminals

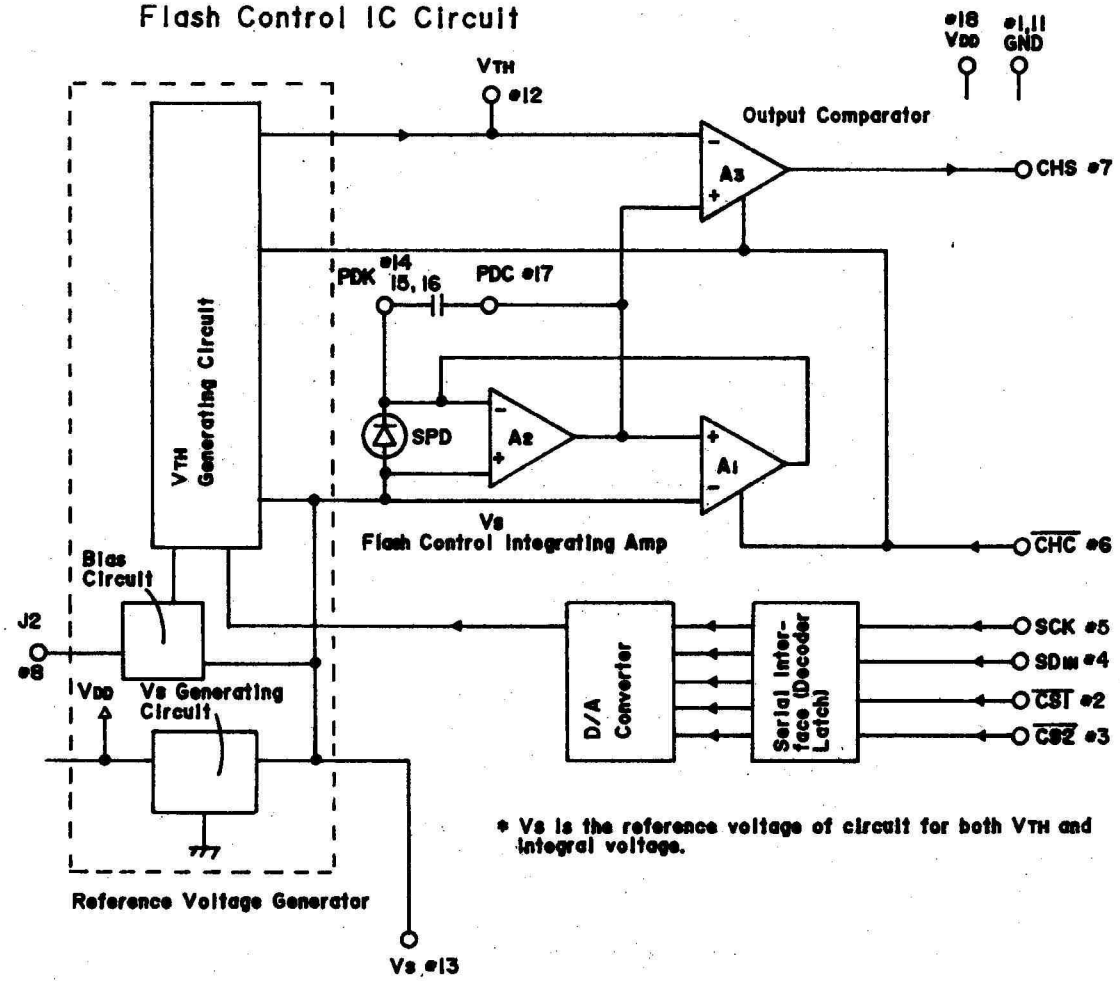
〔Flash control IC terminal arrangement〕



Terminals of Flash Control IC

PIN No	Terminal	Function
1	GND	
2	$\overline{CS1}$	Chip select terminal 1
3	$\overline{CS2}$	Chip select terminal 2
4	SDIN	ISO code serial data input terminal
5	SCK	Serial clock input terminal
6	$\overline{CHC}$	Flash control integration start signal input terminal
7	CHS	Flash control stop signal output terminal
8	J2	VTH bias voltage terminal
9	NC	
10	NC	
11	GND	
12	VTH	Flash control output comparator ref. voltage terminal (for ISO)
13	VS	Reference voltage output terminal approx. 1.2V
14	PDK	Flash control integration MOS AMP-input terminal (SPD cathode terminal)
15	PDK	Flash control integration MOS AMP-input terminal (SPD cathode terminal)
16	PDK	Flash control integration MOS AMP-input terminal (SPD cathode terminal)
17	PDC	Flash control integration MOS AMP output terminal
18	VCC	Supply voltage application terminal

Flash Control IC Circuit



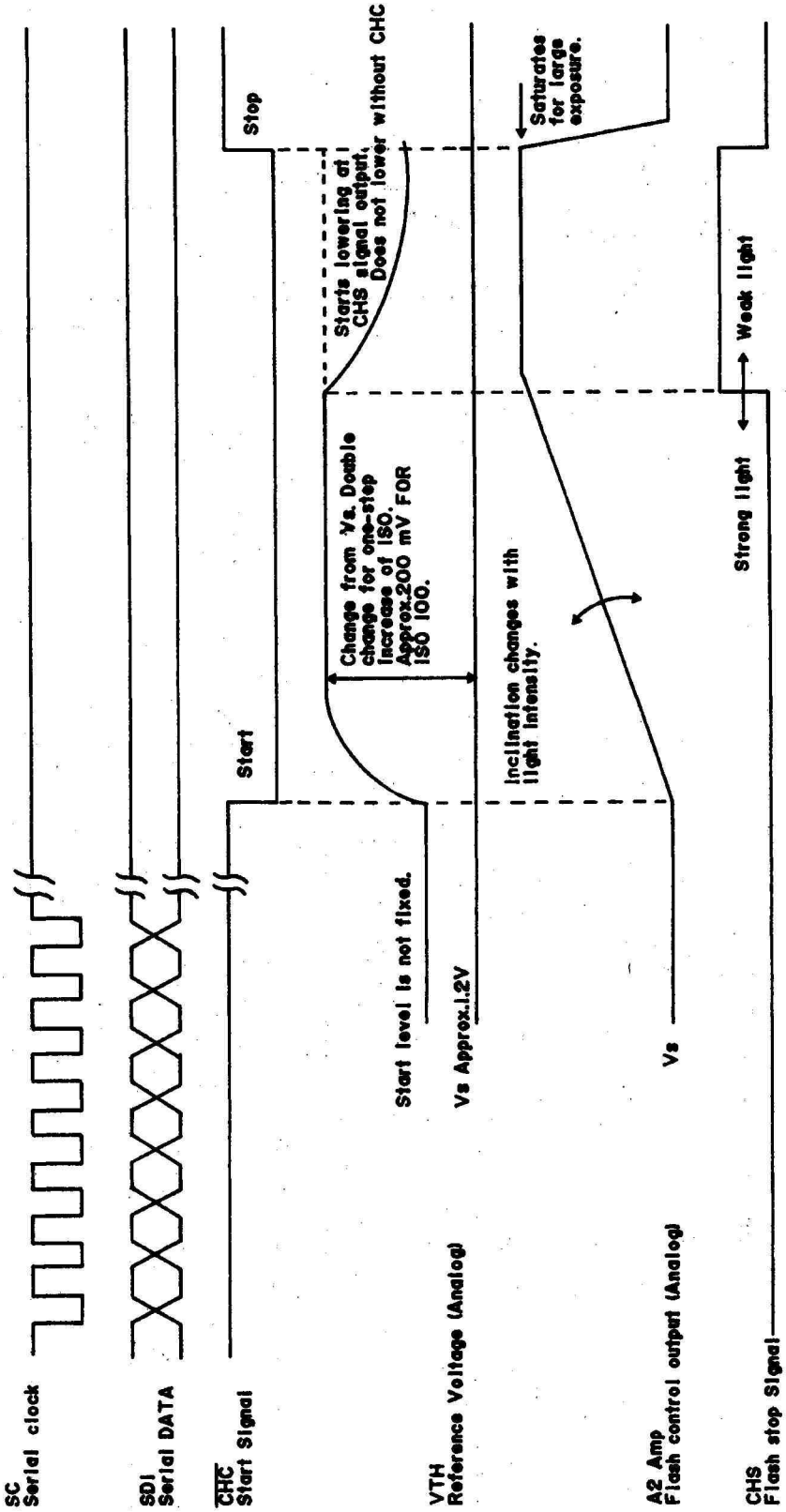
① V_{TH} is determined by the codes sent in serial communication from terminals #2 to #5. The codes change according to ISO.

② As $\overline{CHC}$(#6) is turned low, short amp A1 cancels the short of integrating amp A2. At this time, V_{TH} rises, too.

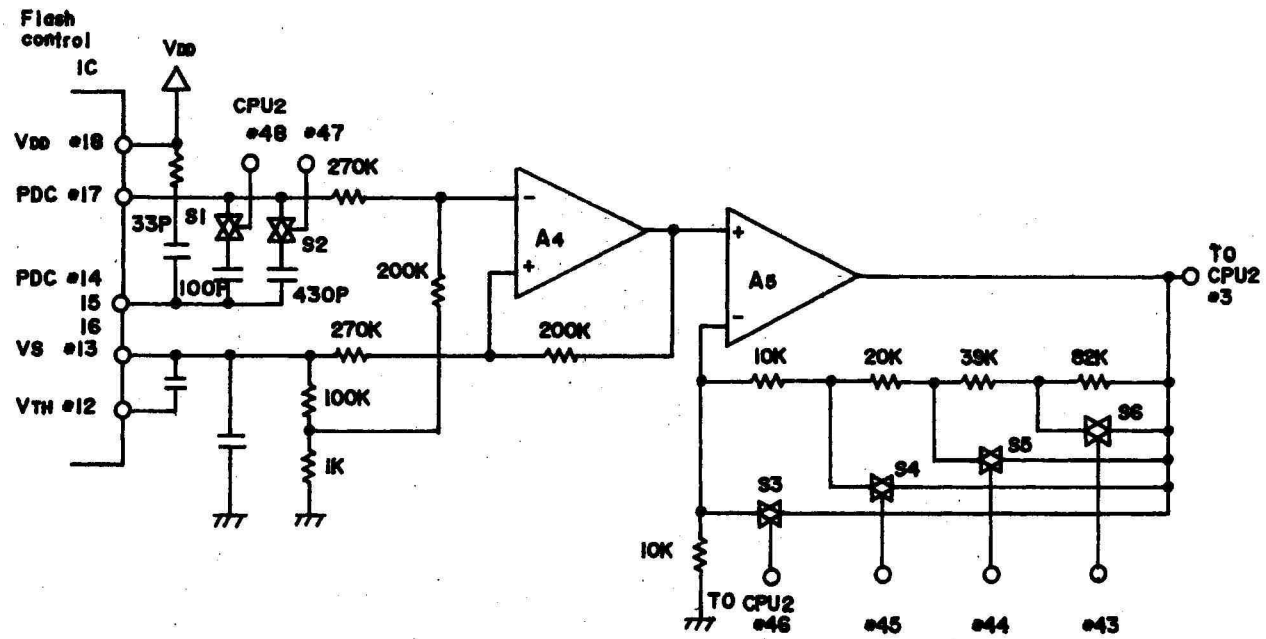
③ The A2 amp not shorted storages the light irradiated to the SPD in the integrating condenser connected between PDK(#14 − 16) and PDC (#17). The result of integration becomes the output voltage of the A2 amp.

④ The integral voltage is input to comparator A3. The other input is V_{TH} determined in ①. When the integral voltage accord with V_{TH}, the flash stop signal CHS (#7) goes "H", thus stopping the flash emission.

Integrating Time Sequence



External Circuit



① The integrating condenser connected between PDK (#14, 15, 16) and PDC (#17) of the flash control IC comprises three kinds of analog switches to obtain a dynamic range.

② The integral voltage is reduced to 0.74 percent by the A4 amp. The integral voltage to be input to the A4 amp uses Vs as reference. Therefore, the Vs component of integrating output is subtracted, using the A4 amp as a differential amp and Vs as the other input.

③ To prevent the absence of output on the A4 amp despite the input of integral voltage due to the minus offset of the A4 amp, the offset is given to the integral voltage at the stage of input, so that there is the output of A4 amp from the beginning. This offset is made by dividing Vs 100:1 with resistors of 100 K and 1 K.

④ The integral voltage whose Vs component has been subtracted is input to the A5 amp. The A5 amp is a non-inversion amplifier with variable gains of 1, 2, 4, 8, and 16. The gain is controlled from CPU2 by switching the analog switch.

⑤ The gain is controlled according to the ISO to optimize the voltage level for the A/D conversion of CPU2.

ISO vs. Serial Codes and Amp Gains

ISO	Direct flash control		Pre-flash	
	Serial code	Amp gain	Serial code	Amp gain
Compens. -⅓	11110	×1	11110	×1
-⅔	11110			
-1	11101			
-1⅓	11100			
-1⅔	11010			
-2	11001			
6	11000			
8	10110			
10	10101			
12	10100			
16	10010			
20	10001	×2	11101	
25	10000		11100	
32	01110		11010	
40	01101	×4	11001	
50	01100		11000	
64	01010		10110	
80	01001	×8	10101	
100	01000		10100	
125	00110	×16	10010	
160	00101		10001	×2
200	00100		10000	
250	00010		01110	
320	00001		01101	×4
400	00000		01100	
500			01010	
640			01001	×8

ISO	Direct flash control		Pre-flash	
	Serial code	Amp gain	Serial code	aAmp gain
800	00000	×16	01000	×8
1000			00110	×16
1250			00101	
1600			00100	
2000			00010	
2500			00001	
3200			00000	
4000				
5000				
6400				
Compens. -⅓				
-⅔				
-1				
-1⅓				
-1⅔				
-2				

* For the same ISO values, direct flash control and pre-flash function use different serial codes and amp gains.

Relationship between Serial Code and V_{TH}
(ISO: reference values that can vary with adjustment values)

Serial code	V_{TH} (mV)	ISO	
		Direct flash control	Pre-flash
11110	2500	Compens. 2/3 . 2/3	Compens. 2/3 ~ ISO16
11101	2000	Compens. 1/3	ISO 20
11100	1600	3/3	25
11010	1250	2/3	32
11001	1000	1/3	40
11000	800	ISO 6	50
10110	640	8	64
10101	500	10	80
10100	400	12	100
10010	320	16	125
10001	250	20	160
10000	200	25	200
01110	160	32	250
01101	125	40	320
01100	100	50	400
01010	80	64	500
01001	64	80	640
01000	50	100	800
00110	40	125	1000
00101	32	160	1250
00100	25	200	1600
00010	20	250	2000
00001	16	320	2500
00000	12.5	ISO400~ Compens. - 2/3	ISO3200~ Compens. - 2/3

Description of control

1. Start of flash control

   Flash control is performed if the charge complete signal is input to the camera immediately before transmission of the flash control command from CPU1 to CPU2 (refer to "communication").
   In pre-flash function, however, flash control is performed irrespective of the presence or absence of charge complete.

2. Setting of reference voltage V_{TH}

   With flash control in effect on completion of communication of the flash control command, the ISO code is sent in serial communication between CPU2 and flash control IC.

3. Setting of gain of external amp

   After the end of serial communication, the gain corresponding to ISO is set. The states of the analog switches are as shown at right.

Gain	S3	S4	S5	S6
× 1	ON	OFF	OFF	OFF
× 2	OFF	ON	OFF	OFF
× 4	OFF	OFF	ON	OFF
× 8	OFF	OFF	OFF	ON
× 16	OFF	OFF	OFF	OFF

4. Setting of storaging condenser

   Direct flash control: S1, S2····OFF
   33pF selected
   Pre-flash : S1····ON, S2····OFF
   133pF selected
   S2 is turned ON during storage for pre-flash.

5. Timing chart

   Flash, storage and flash control are performed after operations 1 to 4.

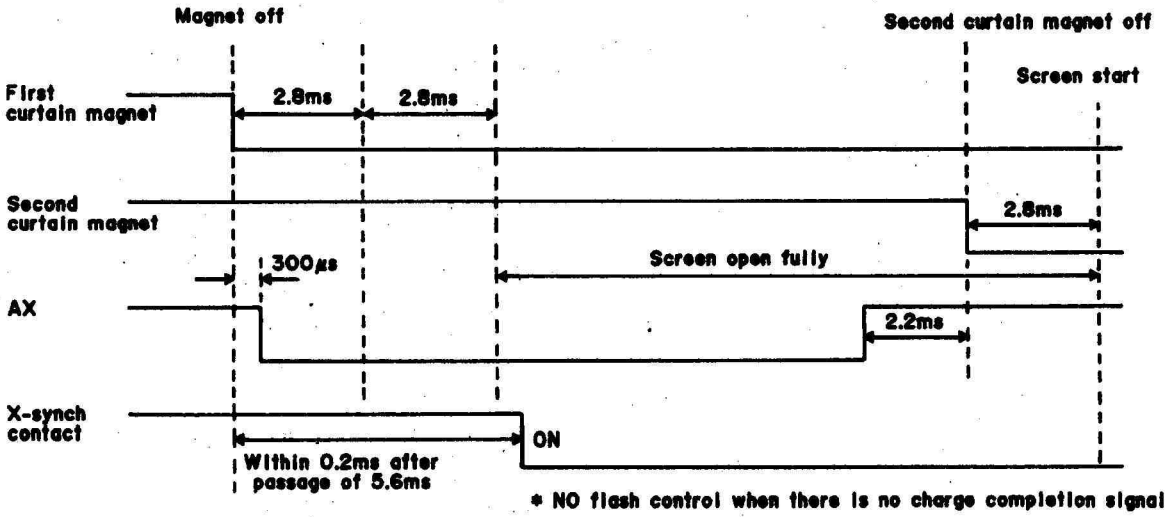
5. Flash Timing

5-1-1

The AX signal is turned low 300 μs after turning-off of the first curtain magnet. The synch contact turns on within 0.2 ms after 5.6 ± 0.7 ms has passed since turning-off of the first curtain. (First curtain cynch: Time is as per shutter specificaiton.)
The AX signal is turned high 2.2 ms before turning-off of the second curtain. (Second curtain synch)

Flash timing

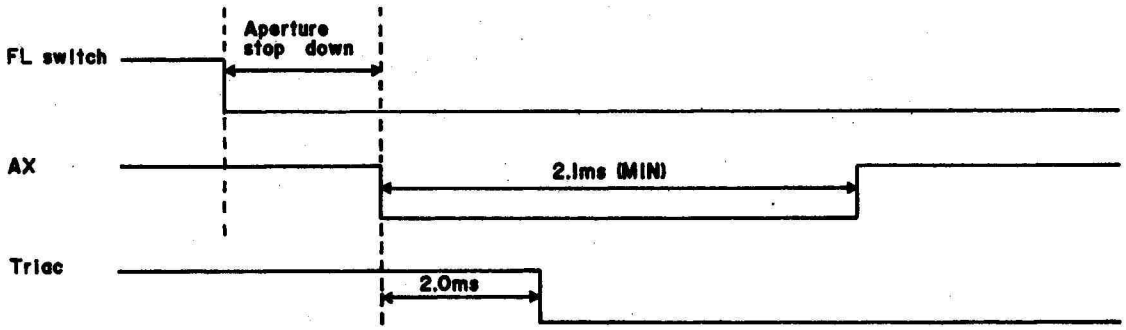
① Normal release sequence



5-1-2

With the pre-flash switch turned on and the aperture stopped down, the triac is turned on 2.0 ms after turning-low of the AX signal. (First curtain synch)
If the flash does not light at this point, the AX signal is turned high. (Second curtain synch)
If the flash lights, no further control is performed.

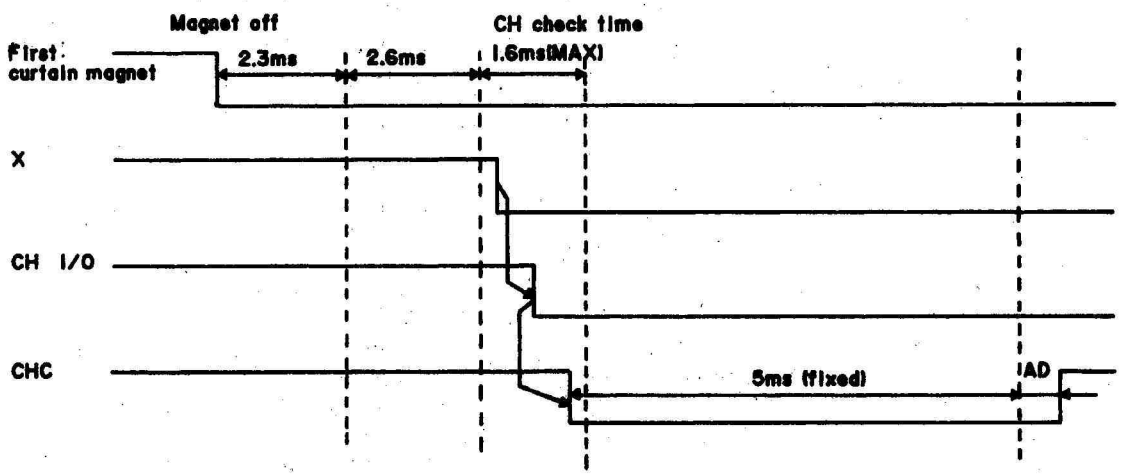
② Pre-flash



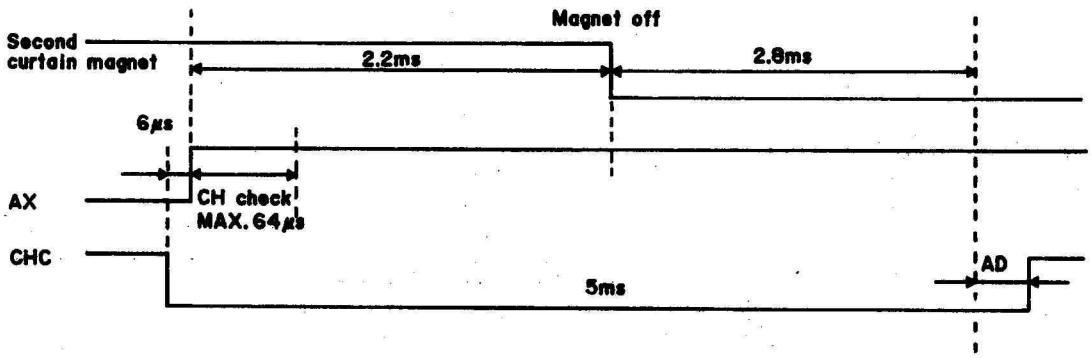
5-2 Storage Timing

5-2-1 Direct flash light control

The CH I/O is checked for 1.6 ms (max.) after 4.9 ms has passed since turning-off of the first curtain magnet and storage is started when the CH I/O turns low during the check.
The storage time is constantly 5 ms irrespective of the shutter time. Five milliseconds, later, A-D convention is performed and then control is completed.



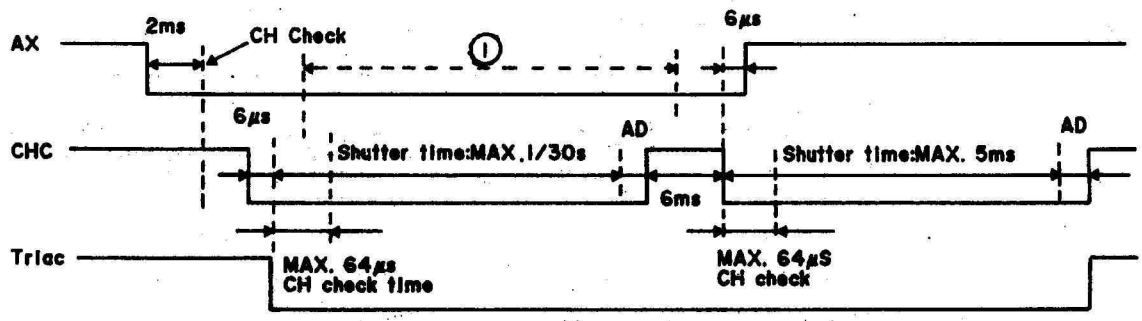
When the flash does not light even by this flash control, the second curtain synch control is started. The $\overline{CHC}$ is turned low 6 μs before turning-high of the AX signal and then storage is started. The CH I/O is checked for 64 μs (max.) after turning-high of the AX and when the CH I/O turns low, storage is performed for 5 ms (fixed) and control is completed after A-D convertion. If the CH I/O keeps high, the $\overline{CHC}$ is turned high and control is completed after interruption of storage.



5-2-2 Pre-flash

The CH I/O is checked 2 ms after turning-low of the AX signal and the triac is turned on when the CH I/O turns high. The $\overline{CHC}$ is turned low 6 μs before turning-on of the triac and then storage is started. After turning-on of the triac, the CH I/O is checked for a maximum of 64 μs and storge is continued if the CH I/O turns low during the check. The storage time is a maximum of 1/30 s, which is equal to the shutter time in this case. (First curtain synch)

The $\overline{CHC}$ is turned low 6 μs before turning-high of the AX signal and storage is started. After turning-high of the AX, the CH I/O is checked for a maximum of 64 μs and storage is continued if the CH I/O turns low during the check. The storage time is a maximum of 5 ms, which is equal to the shutter time in this case. If the CH I/O keeps high, control is completed after interruption of storage. (Second curtain synch)



* Control ① only is performed when there is no charge completion signal.

CPU1

(1) Outline of functions

① Read of time code, exposure mode, theta compensation, aperture setting and ISO setting value
② Read of measured data by center-weighted average metering
③ Exposure operation according to setting
④ Display on aperture LCD (lower area in viewfinder) and counter LCD
⑤ EL drive control
⑥ Power hold control
⑦ EEPROM read/write control
⑧ C-IC port read
⑨ Communication with CPU2: DX data, spot metering, flash control, data receiving, operation command transmission
⑩ Pre-flash control
⑪ Shutter control (via C-IC)
⑫ Self-timer LED flickering control

(2) Notes

Power source

The CPU1 is driven at VCC voltage. It is not reset as long as the battery is not removed. Resetting is controlled by the reset IC. The IC gives a reset signal when VCC drops below 3.7 V. When a new battery is installed, resetting is not performed until VCC rises above 3.7 V.

Power off

The CPU1 operates at 8 MHz clock while power to the camera is turned on. It is in wait mode after power-off. In wait mode, the CPU does not operate at 8 MHz clock, but operates at 32 KHz.
LCD control only is performed in wait mode. The current consumption in this mode is about 7 μA (about 20 μA in whole). The CPU1 is returned from wait mode to normal mode by interruption from the CPU2 (rise of RCK). Mode transition during power-on is as described below.

Power switch on → C-IC → (PH) DC-DC converter → (VDD) CPU2 → (PCK) CPU1

Power hold

Power is held on for about 16 seconds after operation of a user setting switch or dial. This power-hold time of 16 seconds is renewed at the turning-off of the switch which is operated during power-hold. Switch operation and counting of 16 seconds are controlled by the CPU1. After passage of 16 seconds, the CPU1 gives a power-off command to the C-IC and enters in wait mode.

Passage of 16 sec = CPU1 → (Power-off command) C-IC → (PH) DC-DC converter

EL drive

The EL is driven at AC high voltage. The DC–DC converter produces the AC high voltage while the CPU1 gives a clock signal to the converter. The EL brightness is set to one of two levels according to the clock signal.

EL drive clock

Low brightness drive: Duty (L:H)=1 : 1 Frequency 4.17 kHz

High brightness drive: Duty (L:H)=1 : 4 Frequency 4.17 kHz

For high brightness, operation of 7 ms high brightness drive plus 5 ms low brightness brive is repeated.

Switching between two brightness levels are controlled according to the result of center–weighted metering.

The drive mode is changed from low brightness to high brightness when the metering result is EV10, or from high brightness to low brightness when EV9.

Data read via A–D conversion

The ISO and aperture setting values are transmitted to the CPU1 as resistance division voltages. The CPU1 reads there voltages via A–D conversion. The reference voltage for A–D conversion is the operation voltage (VCC) of the CPU.

The difference between the setting value and the A–D conversion value due to the errors in the VCC and resistance is adjusted by a reference value adjusting value and inclination adjusting value.

The reference value adjusting value adjusts the whole level shift and the inclination adjusting value adjusts the change per step.

→ For details, see "Adjustment"

Light Metering

The output voltage of the metering IC is read via A–D convertion. In this case, the reference voltage for A–D conversion is the V REF voltage of the metering IC. (Switching between V REF and VCC is performed in the CPU.) The difference between the metering output and the V REF is adjusted be the metering reference adjusting value and metering inclination adjusting value. The reference adjusting value adjusts the whole level shift and the inclination adjusting value adjusts the output change caused by brightness change.

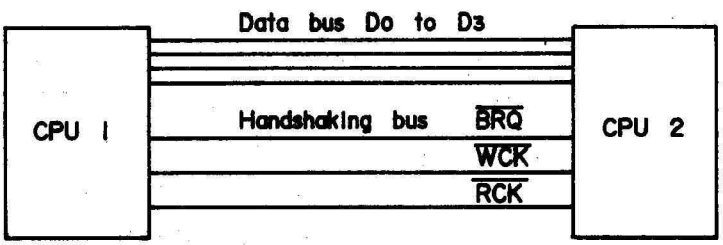
→ For details, see "Adjustment".

Communication between CPUs

The CPU1 commands the CPU2 to control various operations of the camera. The CPU2 analyzes each command from the CPU2 and controls data sending and receiving and mechanical operations. In each sequence, the CPU issues commands continuously for a series of operations.
After each operation by a command, the current state of the CPU2 is returned to the data line as a status code.
When film rewinding has been started by the rewinding start command, the status is changed at every reverse of the frame counter and the CPU1 display the counting down.

1. Connection

The CPU1 is connected to the CPU2 via a 4-bit data bus and three handshaking buses.



① Data bus D_0 to D_3
Transmits and receives commands, data and status information, The input and output bi-lateral are interchangeable.

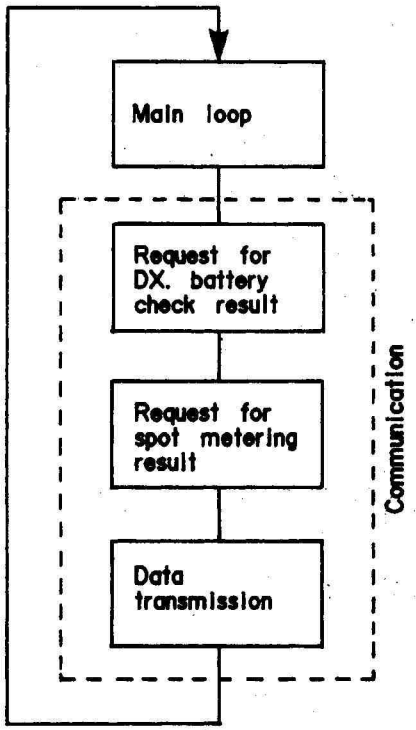
② $\overline{BRQ}$ (Bus Request) CPU1 → CPU2
Controls the transmission direction of the data bus. When the $\overline{BRQ}$ is low, the CPU2 is not changed to the output side.

③ $\overline{WCK}$ (Write Clock) CPU1 → CPU2
Indicates that the command or data issued by the CPU1 is confirmed. (Read request to CPU2)

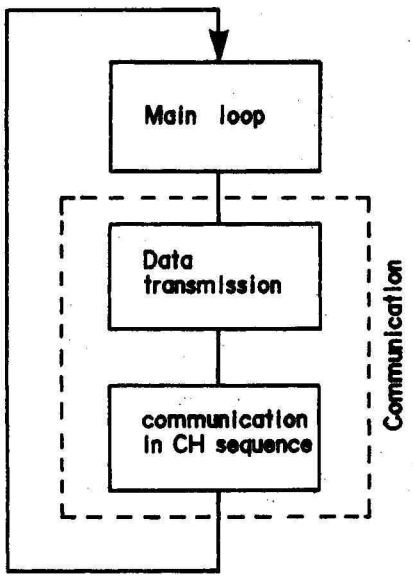
④ $\overline{RCK}$ (Read Clock) CPU2 → CPU1
Indicates the state concerning the read by the CPU2. Turning from "H" to "L" indicates that the CPU2 is ready for read, "L" to "H" indicates the completion of read.

* The functions of the $\overline{WCK}$ and $\overline{RCK}$ are reversed when data are transmitted from the CPU2 to the CPU1.

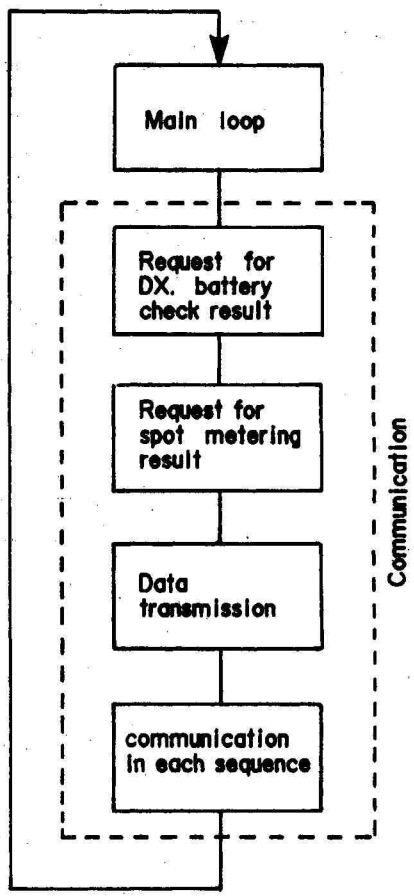
Communication Flow



(1) Power-on mode (no operation)



(2) CH mode



(3) Operation other than (2)

CPU1 Terminal Functions

Pin No.	Terminal	Signal	Function
1	IN4	— —	NO Connection
2	IN3	FL Meter	Flash meter switch input
3	IN2	Metering A	Average metering voltage input
4	IN1	Aperture Data	Aperture setting voltage input
5	IN0	ISO Data	ISO voltage input
6	AVSS	GND	Grounding
7	VREF	Vref	Reference voltage for A-D conversion
8	Vcc	Vcc	Power voltage (Vcc=5V)
9	P57	ESC	Aperture stop down timing output
10	P56	CLK	C-IC communication clock output
11	P55	W/R	C-IC read/write output
12	P54	C/D	C-IC command/data output
13	P53	D3	C-IC data bus 3
14	P52	D2	C-IC data bus 2
15	P51	D1	C-IC data bus 1
16	P50	D0	C-IC data bus 0
17	P37	RW1	EEPROM chip selection
18	SCLK	SCK	Serial clock output
19	SOUT	SDO	Serial data output
20	SIN	SDI	Serial input
21	P33	ELCLK	EL drive clock output
22	P32	CS1	Adjusting unit request input
23	XCIN	←	32KHz
24	XCOUT	←	32KHz
25	INT1	RCK	CPU communication read clock
26	CNVSS	GND	Grounding
27	RESET	RST	Reset input
28	XIN	←	8MHz
29	XOUT	←	8MHz
30	VSS	GND	Grounding
31	P17	CH10	Flash charge completion signal input
32	P16	AX	Second curtain synch output
33	P15	θ2	Theta compensation 2 input
34	P14	θ1	Theta compensation 1 input
35	P13	Open F3	Open F-stop code 3
36	P12	Open F2	Open F-stop code 2
37	P11	Open F1	Open F-stop code 1
38	P10	Open F0	Open F-stop code 0
39	P07	FLOUT	Pre-flash signal
40	P06	EBUSY	EEPROM read signal input

CPU1 Terminal Functions

Pin No.	Terminal	Signal	Function
41	P05	WCK	CPU communication write clock output
42	P04	BRQ	CPU communication request output
43	P03	Da3	CPU communication data bus 3
44	P02	Da2	CPU communication data bus 2
45	P01	Da1	CPU communication data bus 1
46	P00	Da0	CPU communication data bus 0
47	P27	Self Control	Self-timer LED output
48	P26	Exposure 2	Exposure mode 2 input
49	P25	Exposure 1	Exposure mode 1 input
50	P24	TC5	Time code 4 input
51	P23	TC4	Time code 3 input
52	P22	TC3	Time code 2 input
53	P21	TC2	Time code 1 input
54	P20	TC1	Time code 0 input
55	VL3	VL3	LCD drive voltage input
56	VL2	VL2	LCD drive voltage input
57	VL1	VL1	LCD drive voltage input
58	COM0	COM0	AV-LCD common output 0
59	COM1	COM1	AV-LCD common output 1
60	COM2	COM2	AV-LCD common output 2
61	COM3	— —	No connection
62	SEG0	←	AV-LCD drive voltage output
63	SEG1	←	AV-LCD drive voltage output
64	SEG2	←	AV-LCD drive voltage output
65	SEG3	←	AV-LCD drive voltage output
66	SEG4	←	AV-LCD drive voltage output
67	SEG5	←	AV-LCD drive voltage output
68	SEG6	←	AV-LCD drive voltage output
69	SEG6	←	AV-LCD drive voltage output
70	SEG7	←	AV-LCD drive voltage output
71	SEG8	←	AV-LCD drive voltage output
72	SEG9	←	AV-LCD drive voltage output
73	SEG10	←	AV-LCD drive voltage output
74	SEG11	←	AV-LCD drive voltage output
75	SEG12	←	AV-LCD drive voltage output
76	SEG13	←	AV-LCD drive voltage output
77	SEG14	←	AV-LCD drive voltage output
78	SEG15	←	AV-LCD drive voltage output
79	SEG16	— —	No connection
80	SEG17	— —	No connection

CPU2 Terminal Function

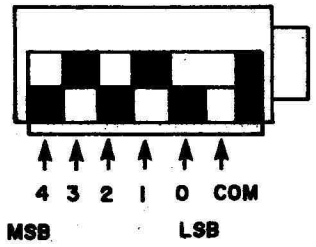
Pin No.	Terminal	Signal	Function
1	IN4	DX4	DX code 4 input
2	IN3	DX3	DX code 3 input
3	IN2	Flash Control	Flash control output voltage input
4	IN1	Metering	Spot metering voltage input
5	IN0	BC	Battery voltage input
6	AVSS	GND	Grounding
7	VREF	VREF	Reference voltage for A-D conversion
8	Vcc	VDD	Power voltage (Vcc=5V)
9	P57	Flash Stop	Flash stop signal output
10	P56	CHC	Flash control integration signal output
11	P55	CS1	Flash control IC chip selection
12	P54	F Close	Aperture stop down completion switch input
13	P53	DX2	DX code 2 input
14	P52	DX1	DX code 1 input
15	P51	DX0	DX code 0 input
16	INT3	AperturePulse	Aperture pulse input
17	P37	CHS	Flash control stop signal input
18	SCLK	SCLK	Serial clock output
19	SOUT	SOUT	Serial data output
20	P34	Vacuum 2	Full section
21	P33	Vacuum 1	Suction at constant current
22	INT2	BRQ	CPU communication request input
23	P31	BUSY	Imprinting-in-frame switch input
24	P30	Imprinting	Imprinting signal/ACK signal output
25	INT1	PF Pulse	Perforation pulse input
26	CNVSS	GND	Grounding
27	RESET	RESET	Reset input
28	XIN	←	8MHz input
29	XOUT	— —	No connection
30	VSS	GND	Grounding
31	P17	PFLED	Perforation LED output
32	P16	FLED	Aperture LED output
33	P15	BCC	Battery check signal output
34	P14	WBK	Winding brake control output
35	P13	WIND	Winding control output
36	P12	LevolvingLimit	Revolving limit plunger control output
37	P11	FMG	Aperture ring stop signal output
38	P10	BRK	Mirror-up/down brake control output
39	P07	CHG2	Mirror-up/down control output
40	P06	CHG1	Mirror-up/down control output

CPU2 Terminal Functions

Pin No.	Terminal	Signal	Function
41	P05	RE1	Rewinding/preview control output
42	P04	RE2	Rewinding/preview control output
43	P03	GC4	Gain control 4
44	P02	GC3	Gain control 3
45	P01	GC2	Gain control 2
46	P00	GC1	Gain control 1
47	P27	C Switching 2	Integration condenser switching 2
48	P26	C Switching 1	Integration condenser switching 1
49	P25	WCK	CPU communication write clock input
50	P24	RCK	CPU communication read clock output
51	P23	Da3	CPU communication data bus 3
52	P22	Da2	CPU communication data bus 2
53	P21	Da1	CPU communication data bus 1
54	P20	Da0	CPU communication data bus 0
55	VL3	←	LCD drive voltage input
56	VL2	←	LCD drive voltage input
57	VL1	←	LCD drive voltage input
58	COM0	←	S-LCD Common output 0
59	COM1	←	S-LCD common output 1
60	COM2	←	S-LCD common output 2
61	COM3	— —	No connection
62	SEG0	←	S-LCD drive voltage output
63	SEG1	←	S-LCD drive voltage output
64	SEG2	←	S-LCD drive voltage output
65	SEG3	←	S-LCD drive voltage output
66	SEG4	←	S-LCD drive voltage output
67	SEG5	←	S-LCD drive voltage output
68	SEG6	— —	No connection
69	SEG6	— —	No connection
70	SEG7	— —	No connection
71	SEG8	— —	No connection
72	SEG9	— —	No connection
73	SEG10	— —	No connection
74	P43	MUP	Mirror-up switch input
75	P42	CHARGE	Charge switch input
76	P41	F Open	Aperture open switch input
77	P40	Revolving Limit SW	Revolving limit switch input
78	SEG15	— —	No connection
79	SEG16	— —	No connection
80	SEG17	— —	No connection

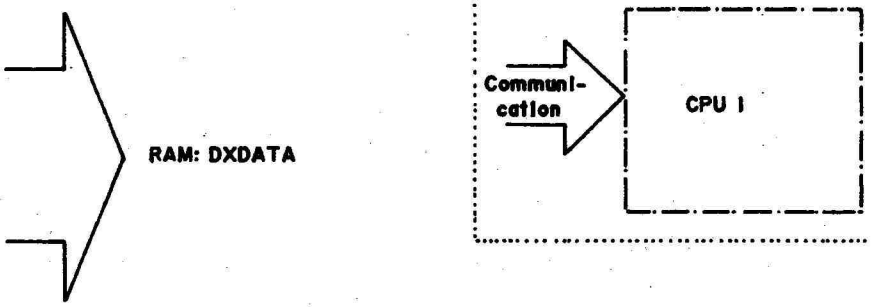
DX Read

Cartridge DX read



Cartridge DX code is read and stored in RAM.

ISO SPEED	DX code (Transmission data)	ISO SPEED	DX code (Transmission data)
25	10111	400	10011
32	01111	500	01011
40	00111	640	00011
50	10110	800	10010
64	01110	1000	01010
80	00110	1250	00010
100	10101	1600	10001
125	01101	2000	01001
160	00101	2500	00001
200	10100	3200	10000
250	01100	4000	01000
320	00100	5000	00000
		None DX	11111



CPU Signal Name	DX5	DX4	DX3	DX2	DX1
DX BIT	4	3	2	1	0

Transmission data	1	0
CPU signal	HI	LOW
Cartridge DX	Black	Silver

EEPROM

EEPROM Terminal Functions

Pin No.	Symbol	Function
1	$\overline{CS}$	Chip selection. Low level during use. Input
2	$\overline{SCK}$	Serial clock. Clock terminal for serial communication. Input
3		Not used
4	DI	Data in. Data input terminal for serial communication
5	DO	Data out. Data output terminal for serial. Communication
6	Vss	Power source ⊖, GND level
7	RESET	Reset. Connected to CS. Input
8		Not used
9	RDY/BUSY	Busy, Low level during data read. Output
10	VDD	Power source ⊕

Content of EEPROM Stores

EEPROM stores the following data and reads out them during camera operation.

- o Adjusted values
- o Backup data

1) Release count
2) Metering data
3) Operation No.
4) Aperture display code
5) Time code
6) ISO ID number
7) Adjusting values for flash control and flash meter
8) Open F code
9) Flash control IC output
10) Flash control time
11) Status information 1
12) Status information 2
13) Status information 3
14) Winding subcommand
15) ABC counter
16) Exposure counter
17) EEPROM write counter

EEPROM write timing

1. Shutter count
   - o At power-off
2. Operation No. and metered data
   - o At power-off
   - o At AE lock switch on
3. Aperture display code or time code
   - o At completion of pre-flash
   - o At completion of flash metering
   - o At change of flash meter setting (aperture, ISO or compensation)
4. Write counter
   - o At power-off
5. Adjusted values of ISO ID number, FL or flash control
   - o Same as 3
6. Open F or storage voltage
   - o Same as 3
   - o At power-off
7. Flash control time
   - o At completion of pre-flash
8. Status information 1 or 2
   - o At power-off
   - o At AE lock switch on
   - o At back cover opening
   - o At release on→off
   - o At valve opening
   - o At completion of mechanism initialization
   - o At T valve on
   - o At completion of loading
   - o At completion of rewinding
   - o At start of preview operation
   - o At valve closing
   - o At completion of preview operation
   - o At flash meter on
   - o At flash meter off
   - o At completion of S or CL sequence
   - o During mirror-up
9. Winding subcommand or status information 3
   - o Same as 8
10. ABC counter or exposure counter
    - o At back cover opening
    - o At completion of loading
    - o At power-off
    - o At completion of rewinding
    - o At completion of preview operation
    - o At Bulb opening
    - o At Bulb closing
    - o At flash meter off
    - o At reverse operation of exposure counter
    - o At release on→off
    - o During mirror-up
    - o At start of previw operation
    - o At flash meter on
    - o At cmpletion of S or CL sequence
    - o At completion of mechanism initialization

P. C. Board Input Codes

1. Shutter P. C. board code pattern

Setting position		P.C. board pattern					Processing code (Hex)	
Time	TV value	D4	D3	D2	D1	D0		
8000	13	1	0	0	0	0	00	
4000	12	1	0	0	0	1	08	
2000	11	1	1	0	0	1	10	
1000	10	1	1	1	0	1	18	
500	9	1	0	1	0	1	20	
250	8	1	0	1	1	1	28	
125	7	1	1	1	1	1	30	
60	6	0	1	1	1	1	38	
(60)	6	0	1	0	1	1	38	Dummy pattern
30	5	1	1	0	1	1	40	
15	4	1	0	0	1	1	48	
8	3	1	0	0	1	0	50	
4	2	1	1	0	1	0	58	
2	1	1	1	1	1	0	60	
1S	0	1	0	1	1	0	68	
2S	-1	1	0	1	0	0	70	
4S	-2	1	1	1	0	0	78	
X125	7	1	1	0	0	0	28	

* The processing of dummy 1/60 is the same as that of 1/60.

2. Drive P. C. board code pattern

Setting position	P.C. board pattern			Processing code (Hex)
	D2	D1	D0	
S	1	1	1	80
CL	1	1	0	40
CH	1	0	0	10
SELF2	1	0	1	20
SELF10	0	0	1	02
MULTI	0	1	1	08

3. Exposure mode code pattern (shutter P.C. board)

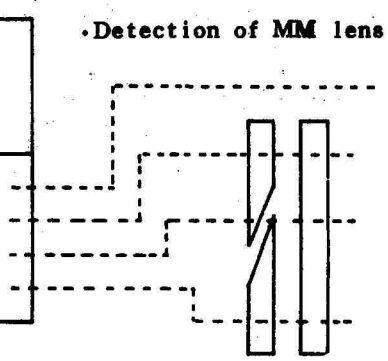
Setting position	P.C. board pattern		Processing code (Hex)
	D1	D0	
Av	1	0	02
Tv	0	0	00
M	0	1	01
B	1	1	03

4. Open F.P.C. board code pattern

Setting position		P.C. board pattern				Processing code (Hex)
F value	AV value	D3	D2	D1	D0	
1.4	1.0	0	0	0	1	08
1.7	1.5	0	0	1	1	0C
2.0	2.0	0	0	1	0	10
2.4	2.5	0	1	1	0	14
2.8	3.0	0	1	1	1	18
3.5	3.5	0	1	0	1	1C
4.0	4.0	0	1	0	0	20
4.8	4.5	1	1	0	0	24
5.6	5.0	1	1	0	1	28

5. Theta compensation P.C. board

P.C. board pattern		Lens identification
D1	D0	
1	1	AE lens
1	0	MM lens with theta compensation
0	0	MM lens without theta compensation
0	1	MM lens without theta compensation

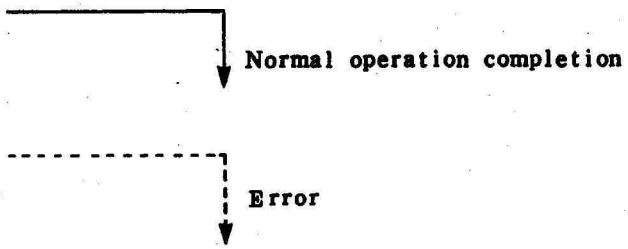


Pattern changed on December 26, 1989

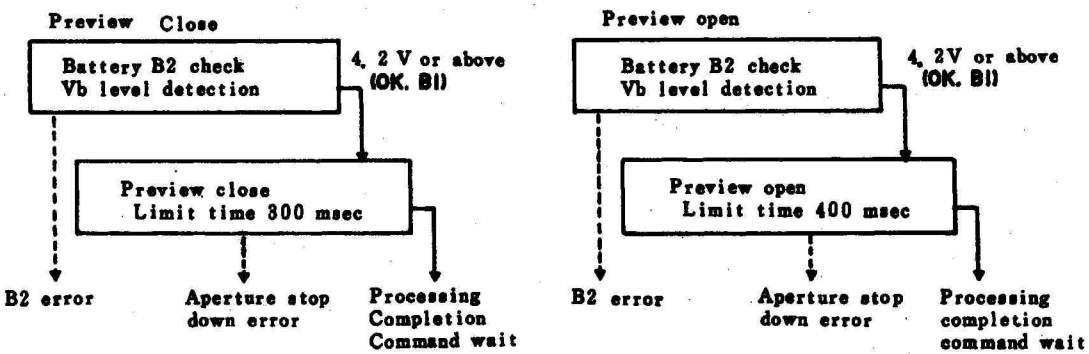
Error Detection

* Camera operation stops at the detection of an error.

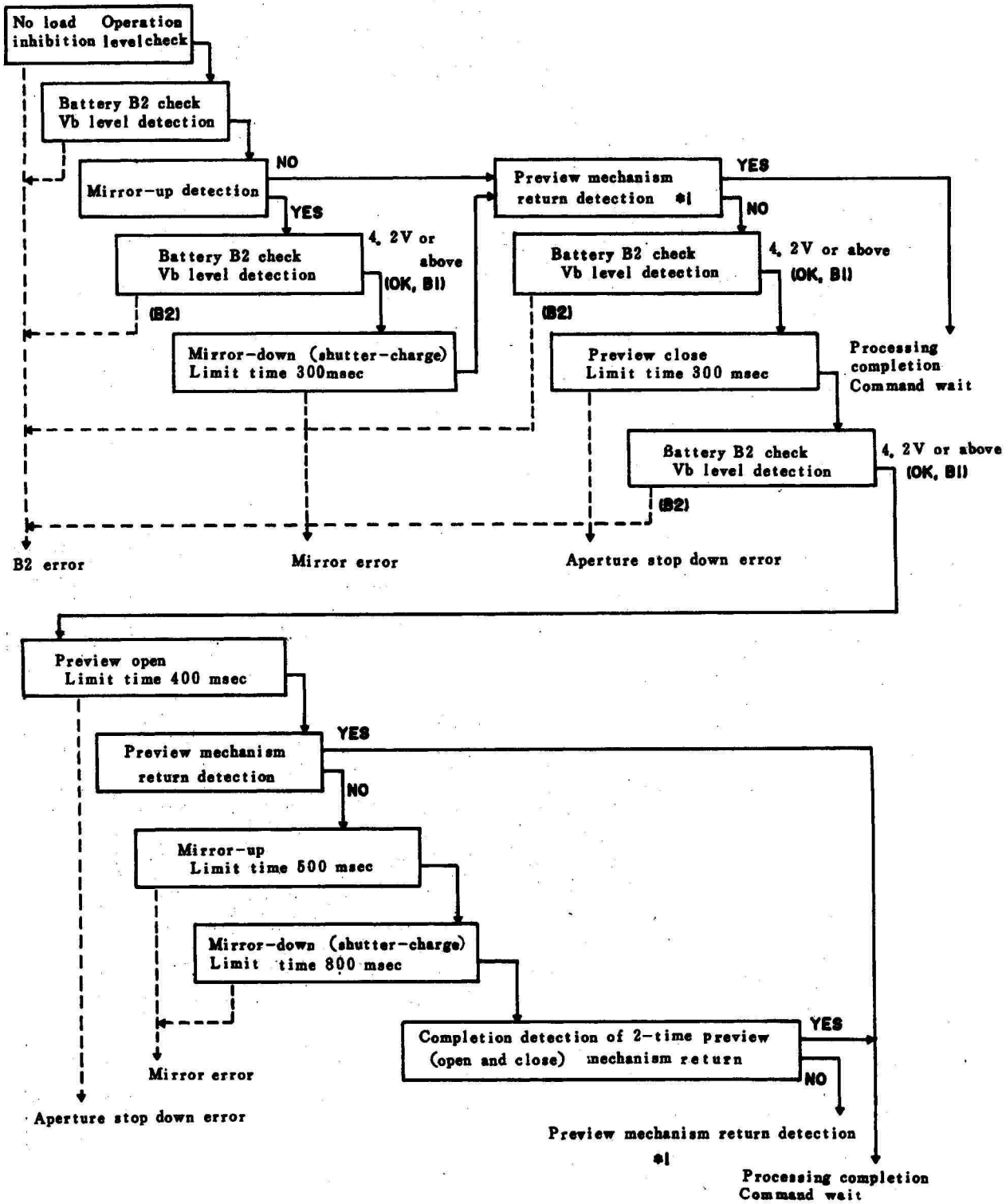
	Counting start	Completion factor
Mirror–up limit time:	Charge motor reverse on	LOW(ON) detection of mirror up switch
Mirror–down limit time (Shutter charge) :	Charge motor forward on	LOW→HI detection of charge switch
Operation limit time for revolving limit magnet :	Revolving magnet on	LOW detection of revolving switch
Winding DC drive limit time (Pulse drive) :	Winding motor on	HI detection of revolving switch
Preview open limit time :	Rewind motor reverse on	LOW detection of aperture open switch
Preview close limit time :	Rewind motor forward on	LOW detection of aperture close switch
Rewinding limit time:	Rewind motor forward on	Detection of sprocket pulses (48 pulses) for one frame



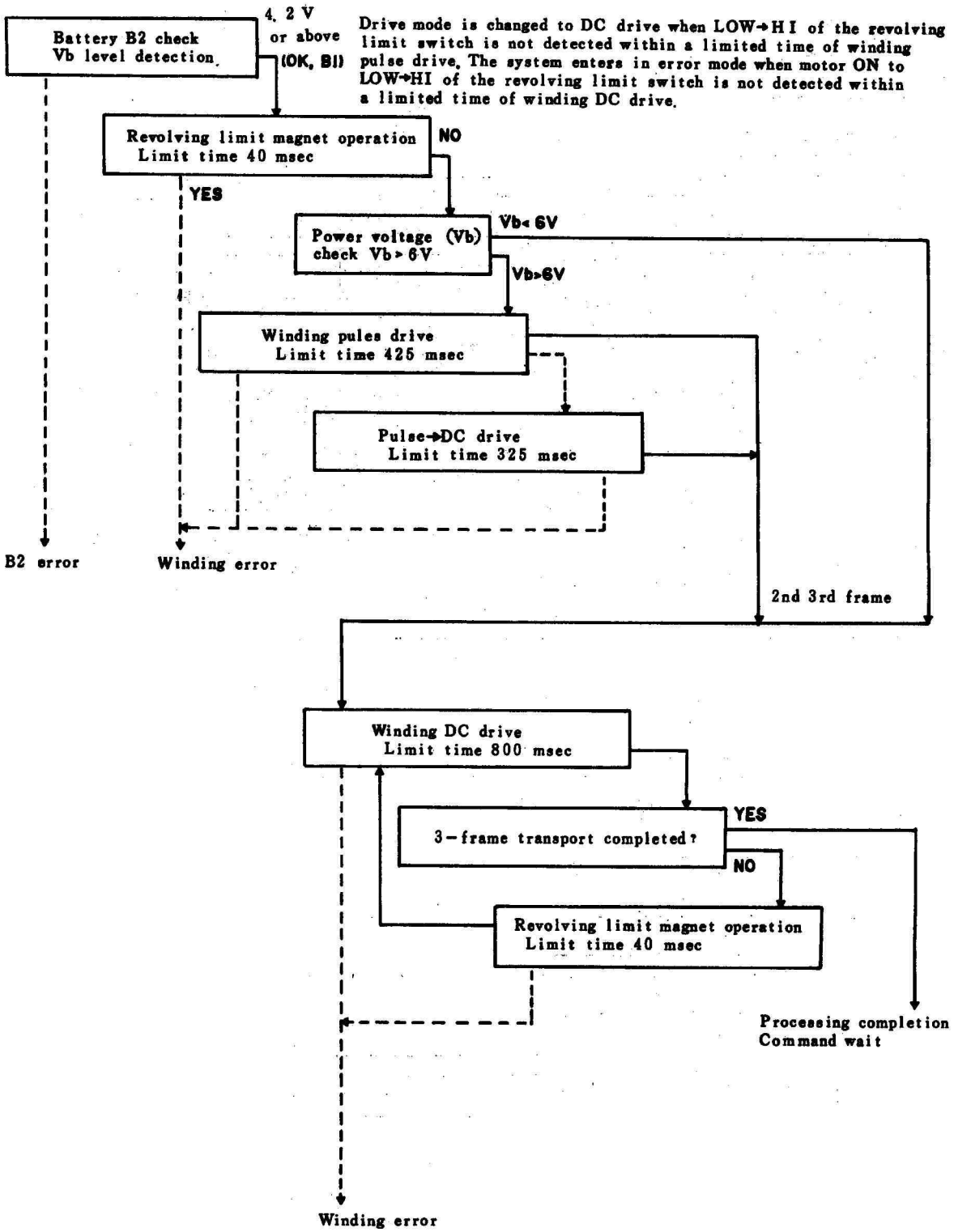
Preview Error Processing



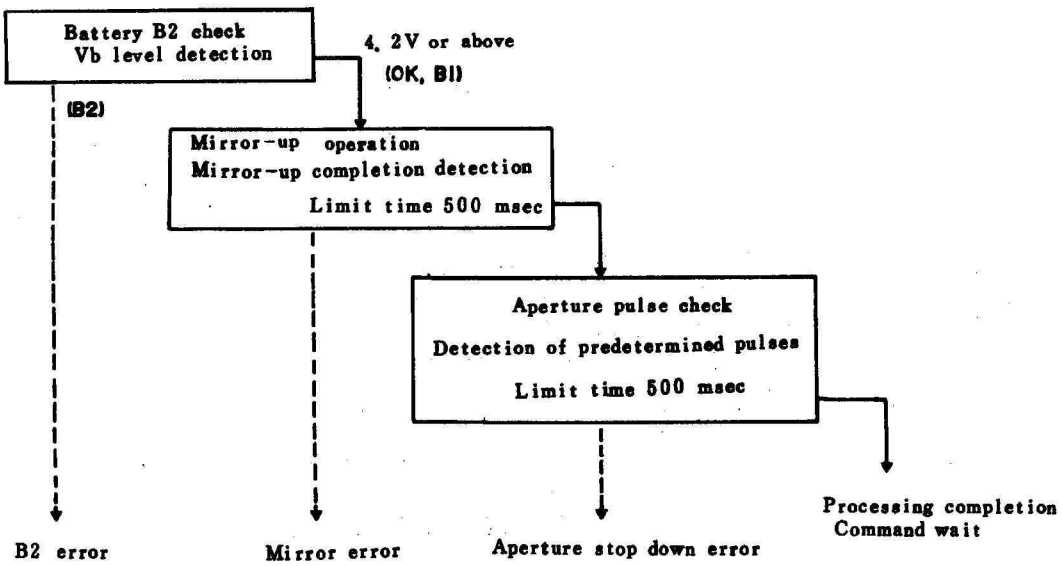
Mech. Initial Error Processing



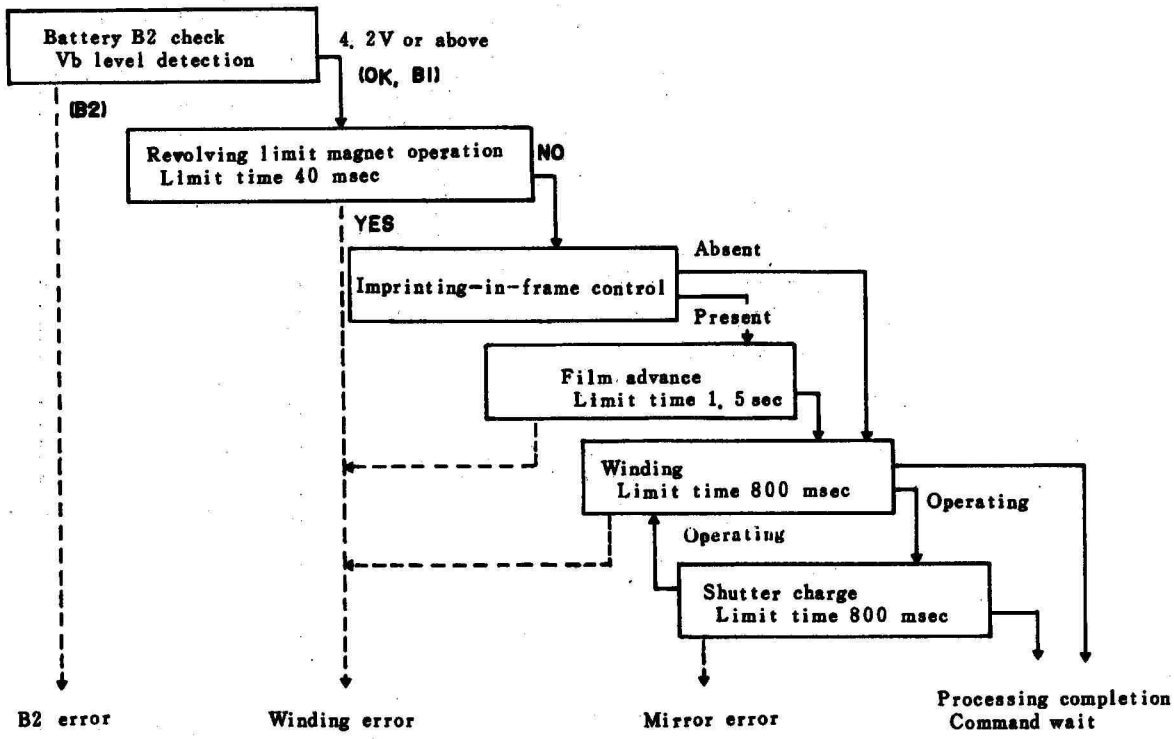
Auto Loading Error processing



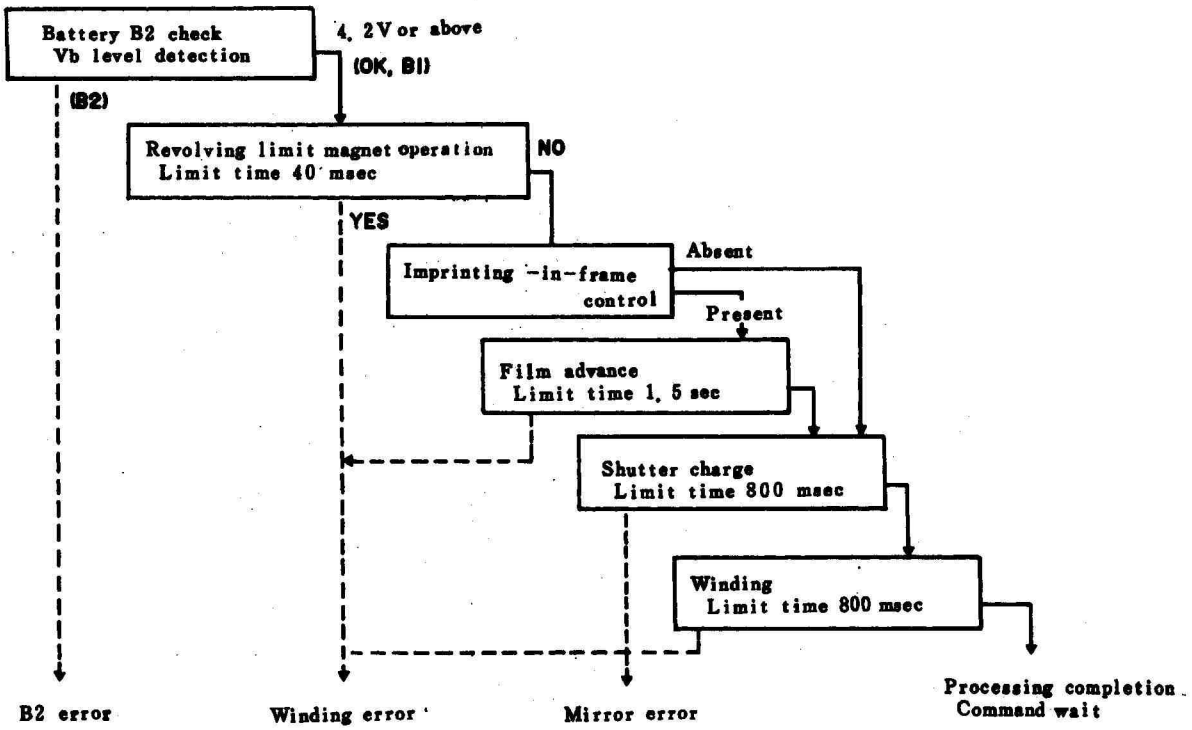
Mirror-up Error Processing



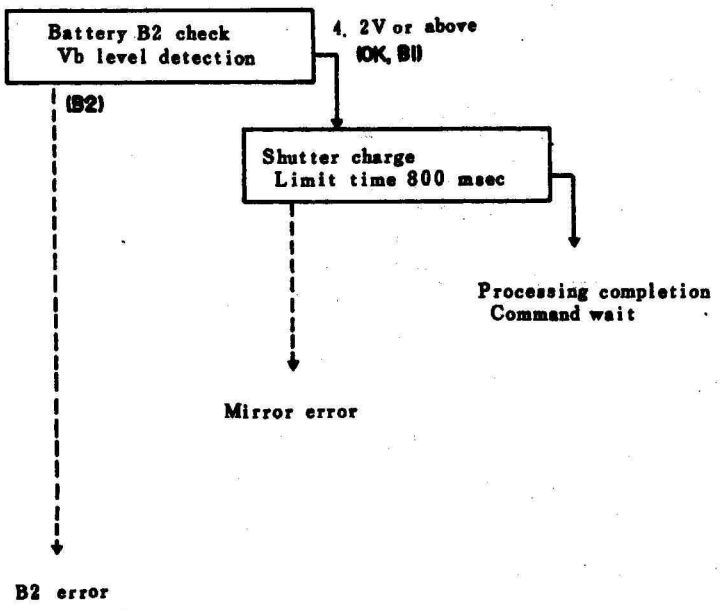
Winding High-speed (CH) Error Processing



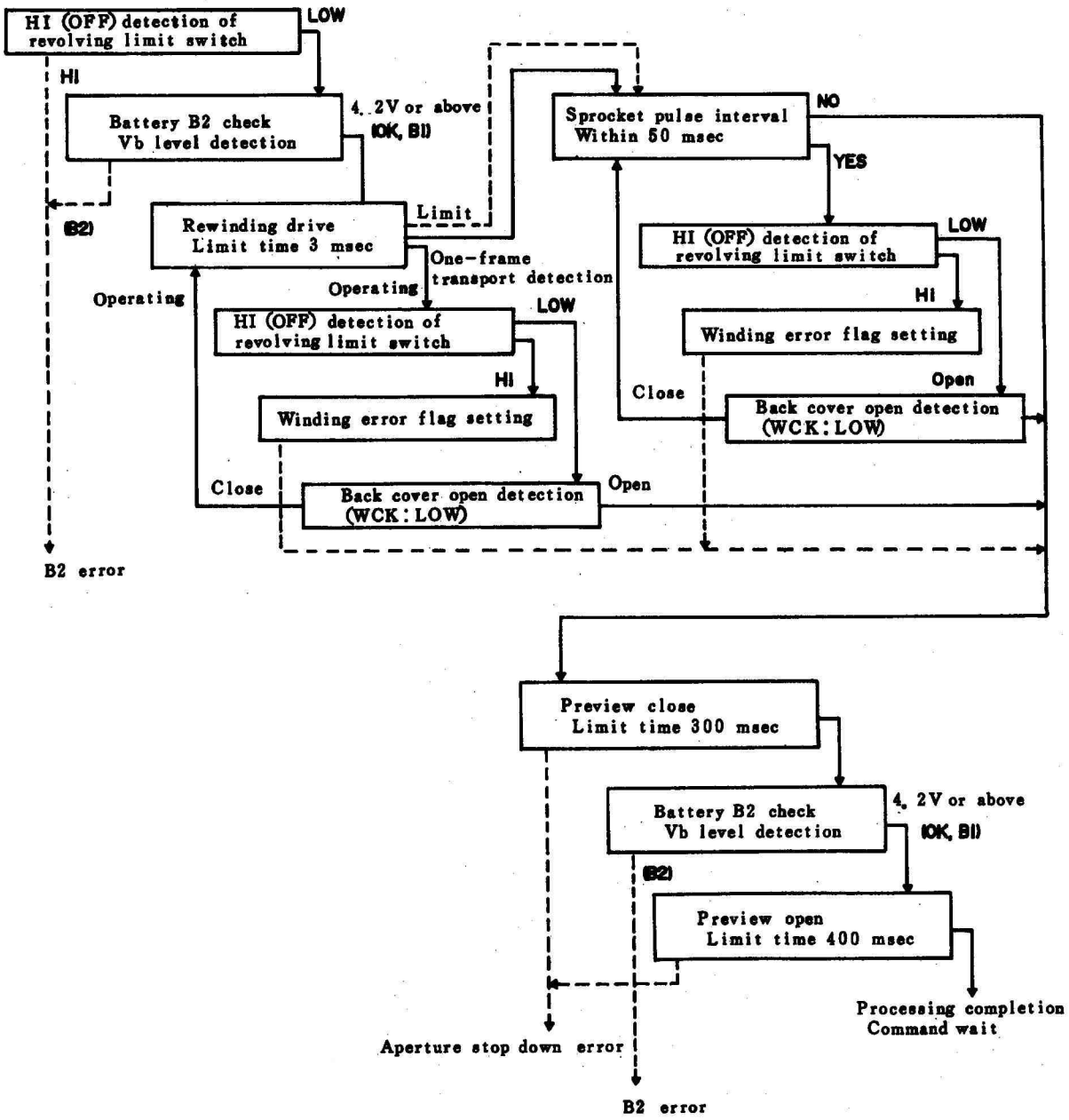
Winding Low-speed (CL) Error Processing

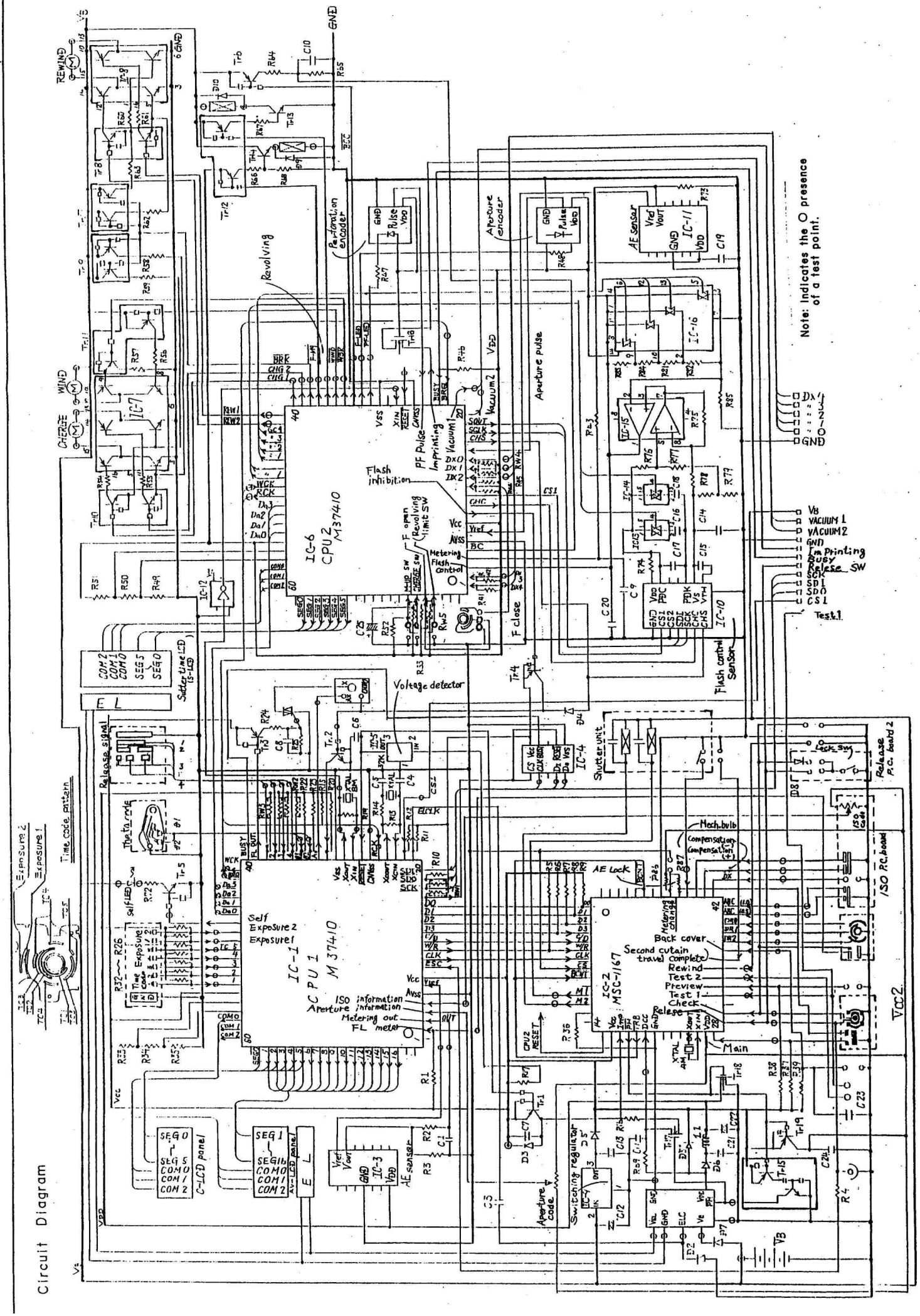


Error Processing for Shutter Charge (Mirror-doun)



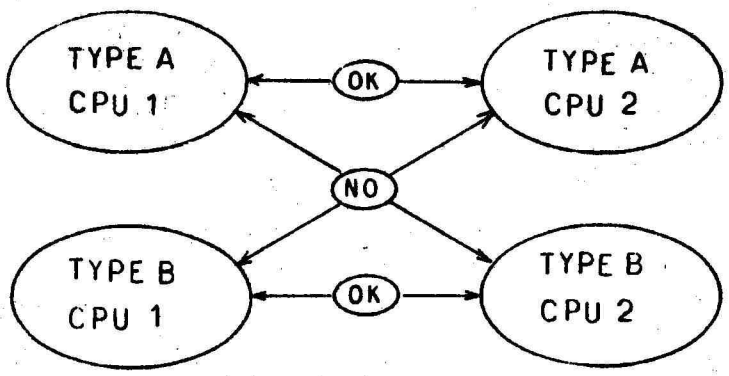
Rewinding Error Processing

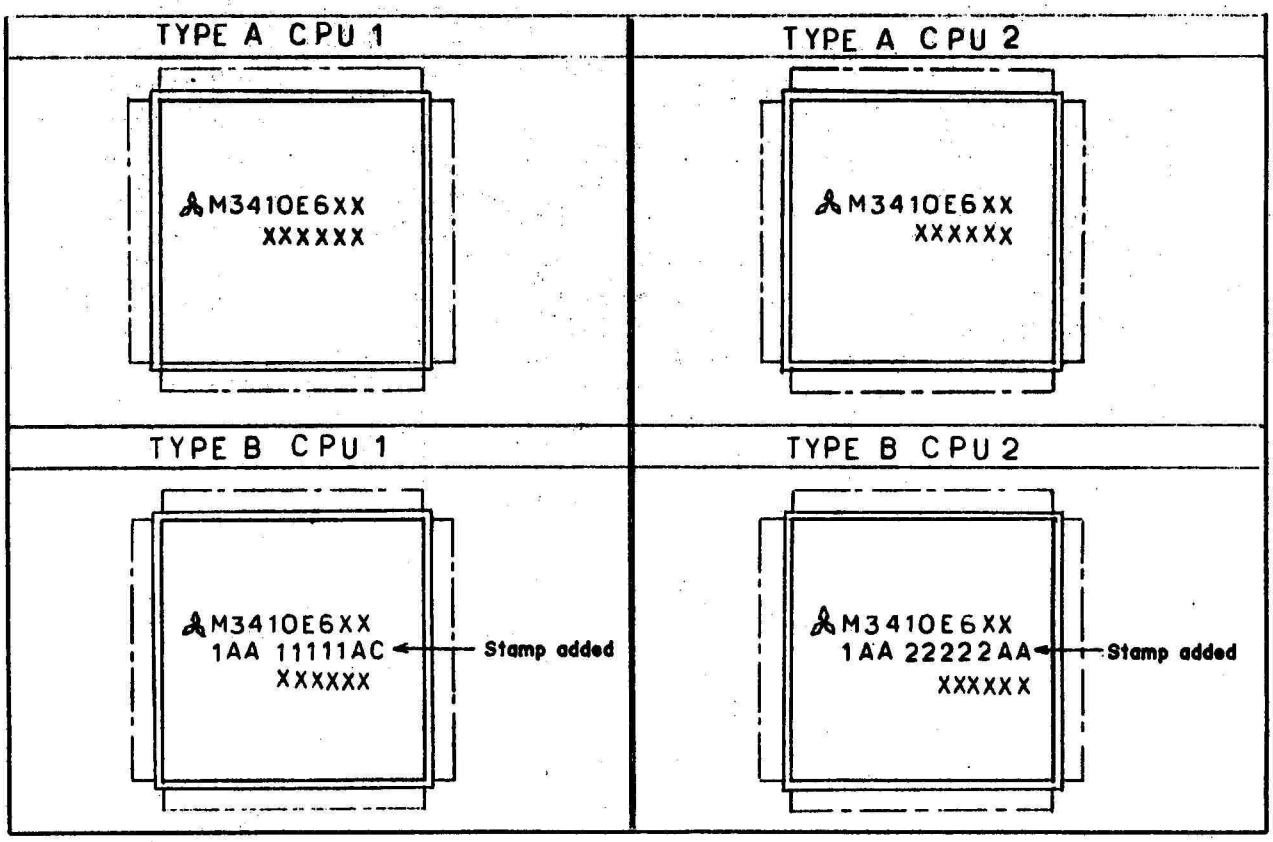




Changed Parts List

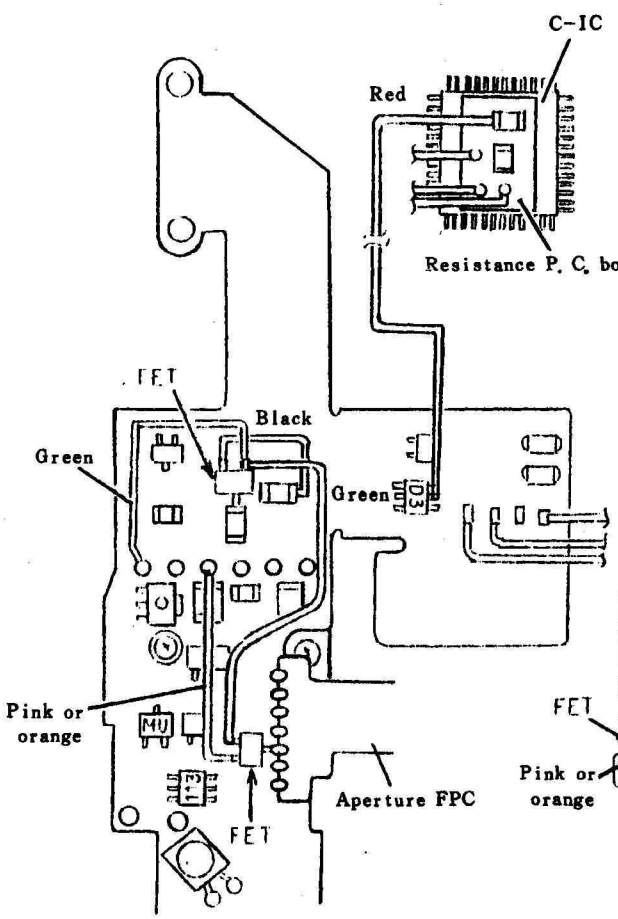
☐ Each of the CPU1 (on the Main FPC Ass'y) and CPU2 (on the Sub FPC Ass'y) has been produced in two types.
The CPU1 and CPU2 of type A are used in initial lots of the cameras.
Type A and type B are not interchangeable. In addition, no CPU1 or CPU2 devices of type A are in stock. Therefore, when the CPU1 or CPU2 of type A is found defective, replace the Main FPC Ass'y and Sub FPC Ass'y with those of type B at the same time.



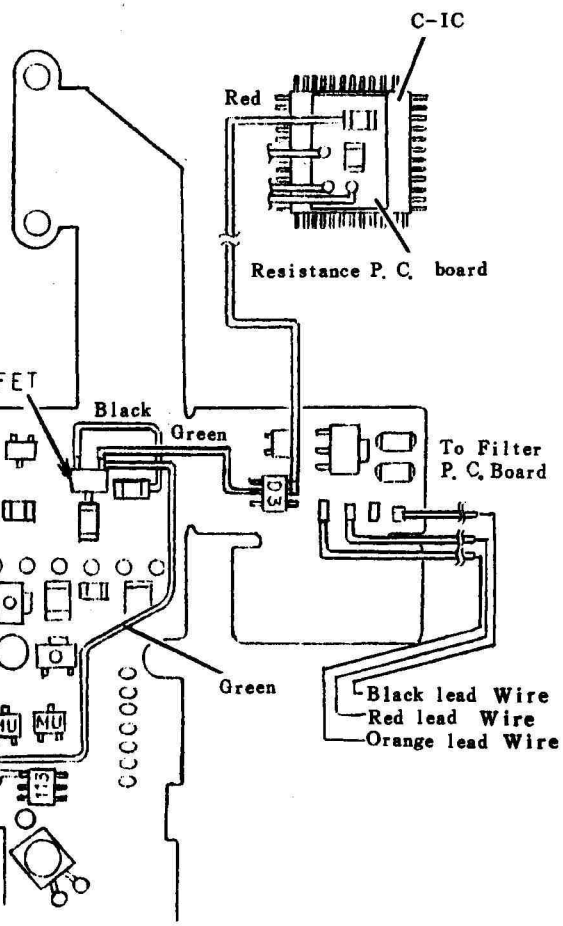


□ FFT was added in the course of production. Therefore, note that the cameras have two different types of wiring. The two types of circuits are interchangeable. This provisional wiring will be abolished in the future.

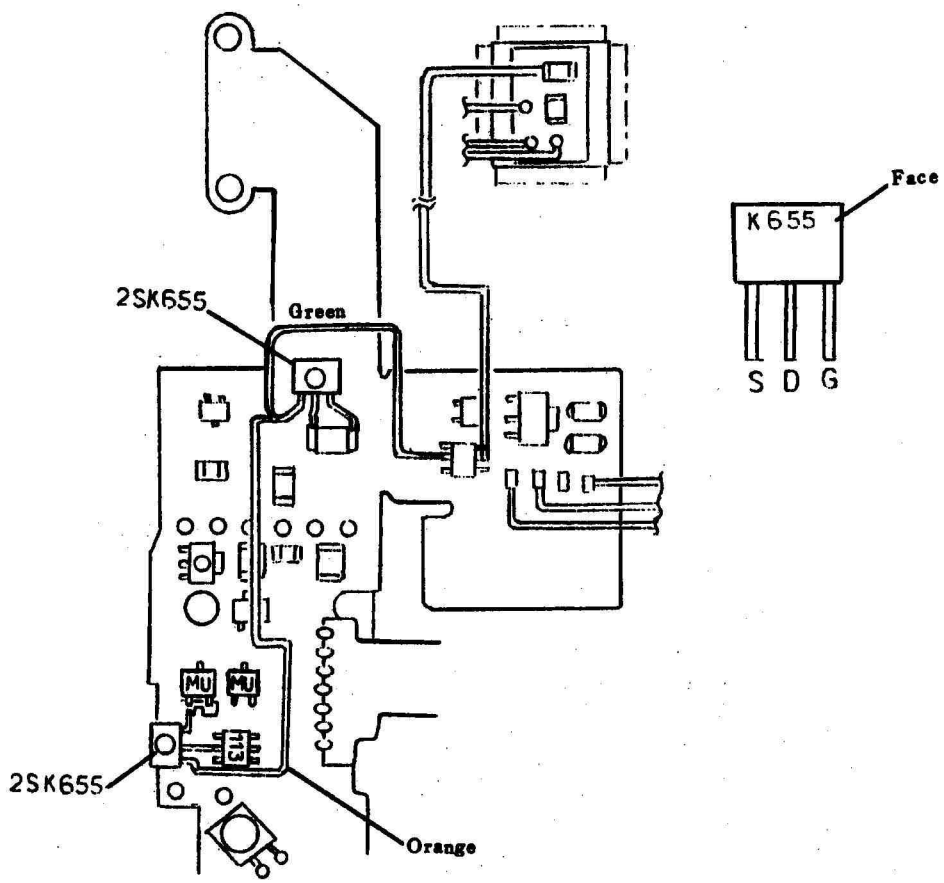
(Type A)



(Type B)



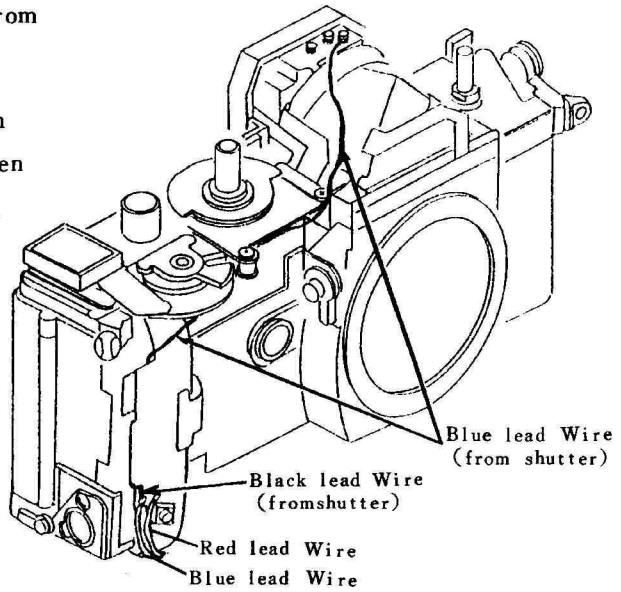
□ Note that the cameras have two types of FET, namely, the chip type 25K620 and the leg type 2SK655. Observe the same instruction as on the previous page.



Note : Solder each of the two parts (FET 2SK655) so that its back can be seen.

□ In the course of production, the wiring and forming of the black and blue leads from the shutter was changed.

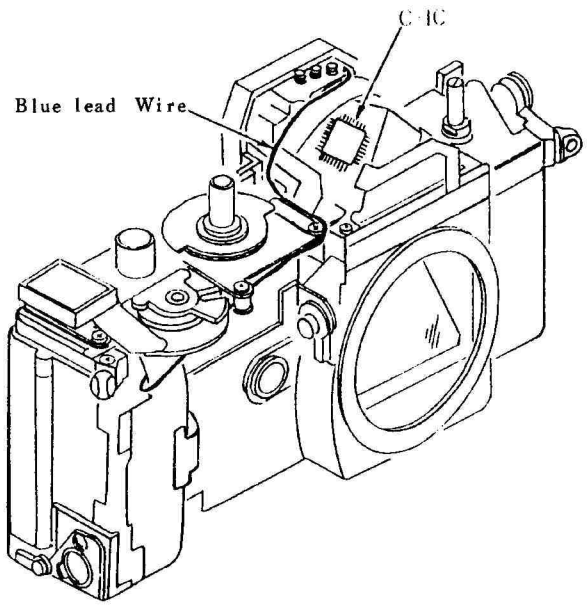
Reason : The camera made an error operation when is was used with a highvoltage flash made by another manufacturer.



〔Modification〕

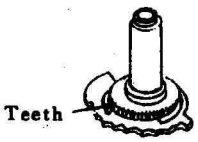
(1) Black lead wires (from Shutter) is discontinued.

(2) Forming of Blue lead wire (from Shutter) is modified and the Blue lead wire must be away from the C-IC.



□ Pattern modify of ISO P.C. Board

In the course of production, the pattern on the ISO P.C. Board was modified. The old type and the new type of the parts listed below are not interchangeable. Therefore, when any of the parts is found defective, replace all the parts at the same time.
Since no old type parts are in stock, replace the old parts, when found defective, with the new type parts. Note that there is no difference in appearance between the old type and the new type of the ISO Name Plate Ass' y, ISO Lock Plate Ass' y and ISO Brush Plate Ass' y.

Part Name	Change	
ISO Name Plate Ass' y (1AAAA030)	Position of ISO numerals of ISO Name Plate is modified by 6 degrees.	
ISO Lock Plate Ass' y (1AAAA420)	Position of teeth on Periphery is modified by 6 degrees.	
ISO Brush Plate Ass' y (1AAAA410)	Contact is modified.	
ISO P.C. Board (1AA56300)	Pattern is modified.